BUNDLING TEST INTERPRETATION FEES INTO MEDICAL VISIT FEES

Episode-Based Analysis of Billing for EKGs and Chest X-Rays

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EXECUTIVE SUMMARY

This report focuses on analysis of physician billing patterns for interpretation of electrocardiograms (EKGs) and chest X-rays in both an inpatient and office setting. These two service sites accounted for 90 percent of the $577 million that Medicare spent on EKGs in 1988 and almost 80 percent of the $510 million that was spent by Medicare on chest X-rays. The purpose of the project was to assess the feasibility of bundling reimbursement for the interpretation of these diagnostic test with a medical visit when the two services are provided jointly.

In order to examine the impact of bundling reimbursement for these services, this analysis investigates the frequency of the following types of situations:

- EKG or chest X-ray services delivered in conjunction with office and inpatient visits;
- Variation in billing for EKGs or chest X-rays and visits by physician specialty;
- Multiple EKGs or chest X-rays delivered to the same patient by one physician;
- Multiple physicians billing for interpretation of one EKG or chest X-ray;
- EKGs or chest X-rays and related visits covering more than one day.

For the purpose of observing these situations, the data have been organized into episodes of care. The episodes have been constructed around EKG and chest X-ray billings from either an inpatient stay or an office-based setting and include all office or inpatient physician visits delivered on the same or adjacent days.

After completion of the episode construction phase, descriptive statistics were produced. Key findings for office-based EKG services are as follows:

- 92 percent of bills for office-based EKG services were global (professional and technical components);
- 79 percent of office-based EKG episodes had at least one visit;
- 96 percent of episodes had one interpretation only;
- only 5.5 percent of episodes involved more than one physician;
- only 5 percent of office visits billed in conjunction with an EKG were coded as brief or minimal.

For the inpatient setting, findings related to EKG services include the following:

- 92 percent of claims for inpatient EKG services were for the professional component only;
- only 13.8 percent of inpatient EKG episodes had at least one visit;
- 31 percent of episodes included more than one interpretation;
- only 5.2 percent of episodes involved more than one physician;
- only 10 percent of visits billed in conjunction with an EKG were coded as brief or minimal.

Key findings for office-based chest X-ray services are as follows:

- 79 percent of office-based chest X-ray episodes had at least one global bill (professional and technical components);
- 65 percent of office-based chest X-ray episodes had at least one visit;
- 95 percent of episodes had one interpretation only;

- 18.3 percent of episodes involved more than one physician;
- only 6 percent of office visits billed in conjunction with a chest X-ray were coded as brief or minimal.

For the inpatient setting, findings on chest X-rays include the following:

- 75 percent of allowed charges for inpatient chest X-rays were for the professional component only;
- only 1.4 percent of inpatient chest X-ray episodes had at least one visit;
- 15.5 percent of episodes included more than one interpretation;
- fewer than 3 percent of episodes involved more than one physician;
- 16 percent of visits billed in conjunction with a chest X-ray were coded as brief or minimal.

Several of these findings contrast markedly across delivery site for both EKGs and chest X-rays. First, the majority of claims in the hospital are for the professional component only rather than for a global service. This is because the technical component is covered in the Part A hospital payment while it appears that, for office-based services, most physicians own and operate their own EKG or chest X-ray equipment.

More importantly, only 13.8 percent of inpatient EKG episodes and 1.4 percent of chest X-ray inpatient episodes include a visit compared to 79 percent of office-based EKG episodes and 65 percent of office-based chest X-ray episodes. This may be due, in part, to the differences in the distribution of physician specialty across settings. With respect to EKG services, both internists and general and family practitioners are more likely to bill for a visit in conjunction with an EKG

and these specialties account for a larger proportion of office-based EKG services than inpatient. For chest X-ray services, internists and general and family practitioners are more likely to bill for a visit in conjunction with a chest X-ray and these specialties account for a larger proportion of office-based chest X-ray services than inpatient (42.8 vs. 1.1 percent). It is also likely that much of the difference is attributable to variation in physician practice patterns (for all specialties) between the two settings; in general, an inpatient's care may be more likely to involve a larger number of physicians, each assuming responsibility for a portion of patient care (e.g., test interpretation). These cross-site differences in the proportion of visits billed along with EKGs or chest X-rays have direct implications for the size of potential savings from bundling reimbursement for these services.

The simplest bundling strategy is a combined reimbursement for a medical visit and the interpretation component of an EKG or chest X-ray ordered or performed as part of that visit. The savings from disallowing fees for interpretation of an EKG in an office-based setting are estimated to be between $5.2 and $5.7 million for the 5 percent BMAD sample or from $104 to $114.2 million for the entire Medicare beneficiary population. Taken as a proportion of all Medicare outlays on EKGs and related visits delivered in a physician's office, this represents between a 15.8 and 17.3 percent reduction in reimbursement. The savings from disallowing fees for interpretation of a chest X-ray in an office-based setting are estimated to be between $2.6 and $2.7 million for the 5 percent BMAD sample or from $52 to $54 million for the entire Medicare beneficiary population. Taken as a proportion of all Medicare outlays on chest X-rays and related visits delivered in a physician's office, this represents between a 13.8 and 14.3 percent reduction in reimbursement. These estimates do not account for any change in physician billing practices in response to the implementation of bundling.

Compared to office-based bundling of EKG services, disallowing reimbursement for EKG interpretations billed in conjunction with a physician visit in a hospital setting would result in a much smaller level of savings -- approximately $1.3 to $1.4 million for the 5 percent BMAD sample. When this amount is increased by a factor of 20 to represent the total Medicare population, the savings to the Medicare program amount to approximately $25.9 to $28.5 million. Bundling payment for these types of interpretations with medical visits translates into an 8.6 to 9.6 percent reduction in Medicare outlays for these services. Disallowing reimbursement for chest X-ray interpretations billed in conjunction with a physician visit in a hospital setting would result in a dramatically lower level of savings -- less than $185 thousand for the 5 percent BMAD sample. When this amount is increased by a factor of 20 to represent the total Medicare population, the savings to the Medicare program amount to only $3.7 million. Bundling payment for these types of interpretations with medical visits translates into a 1.8 percent reduction in Medicare outlays for these services. Potential savings from bundling are substantially less in a hospital setting compared to an office setting, primarily because of the smaller proportion of visits billed in conjunction with the diagnostic test.

The estimated distribution of savings by U.S. Census region and physician specialty varies according to the volume of EKGs and chest X-rays billed and the proportion of episodes in which a medical visit is billed along with an test. It should be noted that the figures discussed represent average changes for the entire region or specialty and that there would be winners and losers within each group.

1. INTRODUCTION

1.1 Background

Medicare has experienced a rapid escalation in expenditures on physicians' services since the program was introduced (Waldo et al., 1989). While the number of visits per beneficiary has not changed dramatically over the past decades, the amount of services billed per visit has increased (Freeland and Schendler, 1983). This can be explained by the increased number of physicians treating each case, the advent of unbundling services for billing purposes (i.e., billing for one service as a number of separate services), and the propensity to record a procedure as more complex than it actually is (Mitchell, 1987).

These continued increases in expenditures for physicians' services have prompted reform of the method by which physicians are reimbursed under Medicare. The current transition to a resource-based relative value scale (RBRVS) focuses primarily on reassessing the value placed on each type of service rendered by physicians and altering payment accordingly. However, the new Medicare Fee Schedule, as payment under the RBRVS is called, continues to rely on the Physicians' Current Procedural Terminology Manual (CPT-4) for defining services.

The CPT-4 physician visit definition explicitly states that visits include such services as "the ordering and evaluation of appropriate diagnostic tests" for limited, intermediate, extended, and comprehensive visits. Yet physicians frequently bill for both a medical visit and a separate test interpretation. Bogen et al. (1989), in a study of billing patterns for a variety of diagnostic tests, found that the range in billing for visits along with procedures was large, from 7 percent of the time for nerve conduction tests to almost two-thirds of the time for 12-lead EKGs.

While HCFA continues to study a variety of bundling options for reimbursement of physician services under Medicare, Congress, under the Omnibus Reconciliation Act of 1990, has already mandated (effective as of January 1992) that separate payment for EKG interpretation will not be made if the EKG was ordered or performed as part of a visit in a hospital or office. Physician opposition to this regulation has been strong. As of August 1992, provisions reinstating separate Medicare reimbursement for EKG interpretation had been included in at least six Congressional bills; one of the bills was passed by the full House of Representatives and is pending in the Senate Finance Committee.

1.2 Report Overview

This study focuses on analysis of billings for interpretation of electrocardiograms (EKG) and chest X-rays in both inpatient hospital and physician office settings. These two service sites account for 90 percent of the $557 million that Medicare spent on EKGs and almost 80 percent of the $510 million that Medicare spent on chest X-rays in 1988.[1] The purpose of this analysis is to develop a more thorough understanding of billing patterns for interpretation of these diagnostic tests, in terms of the frequency of billing for interpretation in conjunction with a medical visit and the number and specialty of physicians billing for interpretation of one test. These issues are of particular policy interest in light of the recent regulations under OBRA '90 restricting separate billing for interpretation of EKGs.

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[1] The source for this estimate is the 1988 BMAD I File; charges include all types of EKGs and chest X-rays as well as both procedural components. For more information on the distribution of charges by place of service, see Tables A-1 and A-2 in the appendix to this report.

One of the first steps in preparation for this analysis was to identify the specific procedural codes to be studied.[2] While a careful review of the CPT-4 manual revealed the relevant CPT codes, the creation and use of local codes by individual carriers which describe the same procedures necessitated additional work to ensure complete identification of all procedures. Although the use of these local codes is intended to be for special circumstances only, their use is, in fact, quite widespread.

The second difficulty in identification of the appropriate procedures is distinguishing among the different levels of service. There are three levels of service, also called procedural components, which may apply to the ordering, conducting, and interpretation of diagnostic tests, as follows:

- Professional component only refers to billing solely for interpretation of test results.
- Technical component only includes conducting the test, but no interpretation.
- Global codes encompass both the professional and technical components.

Modifiers to the procedure codes are used to distinguish among levels of service. For many diagnostics, distinct CPT-4 codes that indicate level of service exist and are employed for billing. For others, CPT-4 codes for provision of services can have modifiers appended to indicate whether the bill is for the professional component of a service only. The use of these modifiers is important in terms of alerting carriers to the specific service provided and, thus, the appropriate level of

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[2] See Section 2.2, Tables 2-1 and 2-2 for a listing of the specific codes.

reimbursement. A more detailed discussion of the use of local codes and modifiers is presented in Section 2.2 of this report.

In order to assess the potential impact of the OBRA '90 ruling, the frequency of certain types of occurrences must be observed. The purpose of this analysis is to investigate the frequency of the following types of situations:

- EKG and chest X-ray services delivered in conjunction with office visits;
- Variation in billing for EKGs and chest X-rays and visits by physician specialty;
- Multiple EKGs or chest X-rays delivered to the same patient by one physician;
- Multiple physicians billing for interpretation of one EKG or chest X-ray;
- EKGs or chest X-rays and related visits covering more than one day.

For the purpose of observing these situations, the data have been organized into episodes of care. The episodes have been constructed around EKG or chest X-ray billings from either an inpatient stay or an office-based setting. The algorithm used to build these episodes is described in detail in Section 2.4. After completion of the episode construction phase, descriptive statistics were produced. In Section 3, findings from the analysis of office-based episodes for EKGs are presented and discussed. Proposal of specific bundling strategies and a discussion of their implications for savings in Medicare revenues is included in Section 3-3. Results from the analysis of EKGs delivered in the inpatient setting are presented in Section 4 of the report. Sections 5 and 6 contain corresponding findings for chest X-rays -- in physicians' offices and hospital settings, respectively.

2. DATA SOURCES AND FILE CONSTRUCTION

2.1 Sources of Data

This study relies on the 1988 Medicare Part A/Part B Linked File for BMAD and MedPAR. Information on physician billing was obtained from the BMAD IV Beneficiary File and information on hospital billing from MedPAR. The BMAD Beneficiary File contains approximately 35.1 million records and the linked MedPAR File contains approximately 517,000 records. These files are a five percent sample of all Medicare beneficiary claims. Except where otherwise noted, results are for the five percent sample rather than for the entire Medicare population.

2.2 CPT-4 CODE Identification and Local Code Linkage

According to the 1988 Physician's Current Procedural Terminology (CPT) manual, there are two different types of codes for EKGs, 12-lead and rhythm. For each of these two types of EKGs, three different CPT codes denote whether the EKG is billed as a global, technical or interpretive procedure. Table 2-1 lists the six EKG procedure codes used in our analysis.

TABLE 2-1

93000	Electrocardiogram, routine EKG with at least 12 leads; with interpretation and report
93005	tracing only, without interpretation and report
93010	interpretation and report only
93040	Rhythm EKG, one to three leads; with interpretation and report
93041	tracing only without interpretation and report
93042	interpretation and report only

There are nine different codes for chest X-rays, which denote the number and type of view. In addition, modifiers indicate whether the EKG is billed as a global, technical or interpretive procedure. Table 2-2 lists the nine chest X-ray CPT-4 codes used in our analysis.

TABLE 2-2

71010	Radiologic exam, chest; single view, frontal
71015	stereo, frontal
71020	Radiologic examination, chest, two views, frontal and lateral;
71021	with apical lordotic procedure
71022	with oblique projections
71023	with fluoroscopy
71030	Radiologic examination, chest, complete, minimum of four views;
71034	with fluoroscopy
71035	Radiologic examination, chest, special views. eg, lateral decubitus, Bucky studies

Although the majority of codes for EKG and chest X-ray services use the CPT terminology, some carriers have developed their own local codes. All of the local codes are listed in HCFA's Carrier Information File. A printout of the local codes and their description was reviewed and, whenever possible, local EKG codes were converted to analogous CPT codes. For other local codes, the procedural component (level of service) was missing from the description. In these instances, the modifiers were reviewed to determine what type of procedural component was designated; using this information the remaining local codes were converted to national codes.

2.3 Creation of the Extract File

Once these coding issues were resolved, two separate extract files were created. The first was a reduced data set that included records for all sample beneficiaries with at least one EKG BMAD claim. Over 23.5 million BMAD records and 421,000 MedPAR records were contained in the extract file for EKG interpretations. This extract file contained information on 566,000 Medicare beneficiaries.

The second extract file included records for all sample beneficiaries with at least one chest X-ray claim. Over 23 million BMAD records and 443,000 MedPAR records were contained in the extract file for chest X-ray interpretations. This extract file contained information on 537,000 Medicare beneficiaries.

Certain fields that were essential for the analysis were part of this extract file. The selected BMAD fields were: procedure codes, modifiers, allowed charges, type of service, dates of service, place of service, provider number, and provider specialty. The extract file also included selected fields from MedPAR records if the BMAD expense dates for the EKG fell on or within the MedPAR admission and discharge dates. The selected MedPAR fields of the extract file included: DRG, admission date, discharge date, and indicator for whether a surgery was performed.

2.4 Construction of the Episodes

Analysis of billing patterns for EKG and chest X-ray interpretation and physician visits required the linking of related claims for these services at the beneficiary level. These groups of claims records, called episodes, are amalgamated billing events which can be considered together for analysis. While use of such episodes expands the range of questions which

can be addressed by the data, the rules used to arrange the data into episodes determine the range of possible outcomes. Therefore, the algorithm for episode construction received careful attention. Since the algorithm was identical for both EKGs and chest X-rays, the steps involved will be discussed together.

Two types of episodes were constructed: one for EKG interpretations occurring during inpatient stays and one for interpretations conducted in office settings.

For EKGs or chest X-rays delivered in an inpatient setting, the first step was to construct hospital stays using admission and discharge dates. Within an admission, episodes were built around "anchor" records -- BMAD records denoting a claim for an EKG or chest X-ray with the last or first billing date occurring between an admission and discharge date on a corresponding MedPAR record. The EKG claim could be for an interpretation, global, or technical charge.[1] The BMAD anchor was then combined with BMAD records containing codes for visits by the same physician who performed the diagnostic test.[2] The visit had to be on the same day, the day before, or the day after the test to be included in the episode. Visits which occurred on other days during the hospital stay were not included in episodes, because they were unlikely to have been directly related to the diagnostic service. If more than one EKG or chest X-ray was billed on the same day or on adjacent days, these claims, along

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[1] While neither global or technical claims should have been billed in a hospital setting since the technical component would be part of the Medicare Part A (DRG) bill, such records were not excluded from the analysis. Since global bills include an interpretation component, they were counted with interpretations.

[2] This restriction was made because of the large number of visits received during an inpatient stay. Without restricting the linked visit to the same physician who billed for the test, there would invariably be a visit delivered in every episode.

with related visits, were merged into one episode. Thus, an episode could contain more than one EKG or chest X-ray interpretation as well as more than one visit. Hospital stays could also contain more than one episode.

A BMAD record was an anchor record for an office episode if it was not part of an inpatient episode, but contained an interpretation or global code. BMAD records not containing EKG or chest X-ray codes but with visits which occurred on the same, previous, or subsequent day to an anchor were combined with the anchor to form an episode. Any interpretations which were billed on the same or adjacent days were also formed into the episode, but interpretations more than one day apart remained separate episodes. The number of interpretations per episode, therefore, is one in most cases. Episodes were kept short to avoid including visits for unrelated conditions.

For both inpatient and outpatient episodes, BMAD records containing neither visit nor EKG/chest X-ray bills were eliminated from the file, as were MedPAR records which were not included in any episodes. These extraneous BMAD records would not contain information pertinent to billing for EKG or chest X-ray interpretation or the relationship between interpretations and visits.

In general, the episode length is one day, unless EKG cor chest X-ray services or visits occur on adjacent days. BMAD records containing test or visit billings on adjacent days were concatenated into one episode. Visits and interpretations more than one day away from a given interpretation were considered too likely to be related to a different spell of illness to be included in an episode. An interpretation occurring more than one day away would be likely to have its own visit, technical component, and interpretation bill -- thus forming a unique episode.

It is clear that these rules for constructing episodes influence the results of the analysis. Thus, it is important to consider the tradeoffs inherent in defining episodes of different lengths.

The episode length was set short enough that a relationship between physician visit and interpretation was likely, and, conversely, that spurious visits (i.e., visits unrelated to the ordering, delivery, or evaluation of the test) would be minimized. Visits and interpretations occurring before or after a hospital stay were considered office-based episodes. This concise definition of the episode length contrasts with that used for analysis of billing patterns for other procedures, which may be as long as two weeks pre- and post-hospitalization. The nature of both EKGs and chest X-rays is that the interpretation is generally conducted shortly after the test is performed. Thus, it is unlikely that a patient would be admitted to the hospital after having an office visit at which an EKG or chest X-ray was conducted or ordered but not interpreted, nor would a patient be discharged from the hospital with either of these tests any EKGs performed during the stay left uninterpreted. A limited episode length, however, limits the possible number of interpretations per visit, and the number of physicians interpreting per episode.

3. ANALYSIS OF BILLING FOR EKG'S IN AN OFFICE SETTING

3.1 Introduction

The purpose of this portion of the project is to examine billing patterns for EKGs that are delivered in a physician's office. The underlying aim is to determine the desirability and feasibility of bundling reimbursement for the interpretation of an EKG and an office visit when these two services are provided jointly.

The issue is made more complex given the number of different arrangements under which these services can be provided and the way in which each of these situations may be represented by the available data. The most straightforward situation is when a patient goes to a physician's office for a visit, is administered an EKG, and is informed of the results. This simple situation, however, may be represented by billing records in any of the following ways: (i) a bill for an office visit only; (ii) a bill for an office visit and a bill for the professional component of an EKG; (iii) a bill for an office visit and a global bill for an EKG (both the interpretive and technical components).

Other examples might be far more complicated. A physician could examine a patient, administer an EKG, and then refer the patient to a specialist for interpretation. In this situation, either or both physicians might bill for a visit and/or the EKG. Moreover, these services might or might not be provided on the same day or adjacent days. Given the idiosyncracies of the system of modifiers, it is not always possible to tell which situation occurred from billing records. Five different visit levels defined by the intensity of service add further to the range of possibilities.

From a policy perspective, the basic issue is whether or not it is appropriate to combine reimbursement for interpretation of the EKG and the medical visit. A closely related issue is that of the payment for the technical component, particularly since the vast majority of bills for EKG-related services provided in a physician's office are global bills. In other words, should a physician be allowed to bill for the technical component in addition to the visit but not for the interpretive component? Other issues (to be discussed in more detail in Section 3.3.1) concern bundling of reimbursement over time (visit on one day, test administered on the following day) and across physicians (visit and test by general practitioner, with follow-up interpretation by cardiologist).

Investigation of billing patterns is further complicated by variations in carrier practices. As described in Section 2.2, the use of modifiers varies across carriers and, thus, observed differences in billing by procedural component may be artificial. In addition, individual carriers may have rules concerning some of the situations described above which are not apparent from examining the data files.

The next section presents a variety of descriptive statistics as a step toward improving our understanding of billing patterns for EKGs and related visits in an office setting. The initial sections (3.2.1 and 3.2.2) provide general information on the size of these billings, the services comprised in an episode, and the services received by an average beneficiary. Section 3.2.3 is a more in-depth look at the episodes we have constructed, with detailed information on the numbers of EKG services by procedural component, the number of visits, the number of physicians, and the charges for each type of services delivered. The final two sections examine variation in episode characteristics and billing patterns by physician specialty and U.S. Census region. All of this descriptive

information was necessary in assessing various approaches to bundling services, as described in Section 3.3 of this report.

3.2 Findings

3.2.1 Allowed Charges and Number of Services

Total allowed charges for EKGs delivered in a physician's office and related office visits, as well as the number of these services provided are presented in Table 3-1. For the 5 percent BMAD sample in 1988, total allowed charges for these EKGs amounted to $17.3 million and the total number of EKG services equaled 559,000. The EKG total allowed charge figure, when adjusted by a factor of 20 to represent the entire Medicare beneficiary population, approached $350 million dollars. These charges represented 3.7 percent of the total allowed charges for Medicare-covered office-based services in 1988. Allowed charges for office visits linked to EKG services and their frequency are also presented in Table 3-1. Charges (for the 5 percent sample) totaled $15.6 million, somewhat less than allowed charges for EKGs.

The distribution of charges by procedural component shows that over 90 percent of the office-based EKG charges were for global EKGs. Interpretation charges accounted for 7.5 percent of the EKG charges and technical component charges were infrequently reported in the office setting.[1] A similar ranking of procedural components is obtained when the distribution of the number of

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[1] This contrasts somewhat with the study by Bogen et al. (1989) who found a larger proportion of separate bills for interpretation. Their study included all ambulatory settings, however; an EKG performed in a hospital outpatient department, for example, would most likely have the technical component billed by the hospital (and found on the Medicare outpatient file) and the interpretive component billed by the individual's private physician.

Table 3-1

Total Allowed Charges and Number of Services for EKG Episodes Billed in an Office Setting.

	All EKG-Related Services	EKG				Visits
		All	Global	Interpretation	Technical	
Total Allowed charges	$32,980,087	$17,324,672	$15,964,032	$1,294,572	$66,068	$15,655,415
Percentage		100.0%	92.1%	7.5%	0.4%	
Total Services	991,710	559,134	461,811	94,132	3,191	432,576
Percentage		100.0%	82.6%	16.8%	0.5%	
Ratio of Total Allowed Charges to Total Services	$33	$31	$35	$14	$21	36

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

services is examined. The frequency of global bills for EKG suggests that, in actual clinical practice, the technical and interpretive components are performed simultaneously. EKG machines are present in most physician offices and the skills associated with taking the EKG can be easily learned by office-based personnel.

It should also be noted that there appears to be no financial incentive to billing for the interpretive and technical components separately rather than globally. The ratio of total allowed charges to total number of services shows that global charges per service ($35) are equal to the sum of the technical and interpretation components ($21 and $14, respectively).

Average allowed charges and the average number of services at the beneficiary and episode levels are presented in Tables 3-2 and 3-3. At the beneficiary level, there were approximately 1.5 visits and EKGs per person annually and a total of 2.8 EKG-related services were provided to each beneficiary in 1988.[2] The number of EKG claims (overall and by the procedural component) and the number of office visits each averaged approximately one per episode, since each beneficiary had an average of 1.5 episodes. Each episode consisted of approximately two services (EKG and visit), however. In terms of average allowed charges, the charge per beneficiary was 1.5 times the average charge per episode, which is consistent with 1.5 episodes per beneficiary.

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[2] The services per beneficiary are the total services of a given type divided by the total number of beneficiaries having that type of service. For services per episode, the denominator is the total number of episodes in which that type of service is billed.

Table 3-2

Average Allowed Charges and Average Number of Services for Beneficiaries Receiving a Given Procedural Component or Visit: EKG Office-Based Episodes

		EKG				
	EKG-Related Services	All	Global	Interpretation	Technical	Visit
Average Allowed Charges per Beneficiary _a	$95.00	$50.00	$52.00	$22.00	$24.00	$55.00
Average Services per Beneficiary _b	2.8	1.5	1.5	1.6	1.2	1.5

Notes:

_a Average allowed charges per beneficiary are the total allowed charges for a given procedural component or visit (i.e., total global allowed charges) divided by the total number of beneficiaries having that type of charge.

_b Average allowed services per beneficiary are the total services for a given procedural component or visit (i.e., total global services) divided by the total number of beneficiaries having that type of service.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

Table 3-3

Average Allowed Charges and Average Number of Services for Episodes with a Given Procedural Component or Visit: EKG Office-Based Episodes

		EKG				
	All Services	All	Global	Interpretation	Technical	Visits
Average Allowed Charges per Episode _a	$64.00	$33.00	$36.00	$18.00	$21.00	$38.00
Average Services per Episode _b	1.9	1.1	1.0	1.3	1.0	1.1

Notes:

_a Average allowed charges per episode are the total allowed charges for a given procedural component or visit (e.g., total global allowed charges) divided by the total number of episodes with that type of charge.

_b Average services per episode are the total services for a given procedural component or office visit (e.g., total global services) divided by the total number of episodes with that type of service.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

3.2.2 An Overview of the Episodes

There were 518,333 episodes constructed for 348,302 beneficiaries involving delivery of EKG services in the office setting. Table 3-4 provides an overview of these episodes, including average number of services per episode. (The denominator for these averages is all episodes rather than only those episodes with a given service as in Tables 3-2 and 3-3.) The vast majority of episodes consist of one global claim for EKG services and one visit. Eighty-seven percent of episodes have at least one global bill and the mean number per episode is 0.89. Similarly, 79 percent of episodes have at least one office visit and the mean number of visits per episode is 0.83. There are an average of 1.06 physicians submitting claims per episode.

There are two types of EKGs captured in the data -- 12-lead and rhythm (also called 3-lead). As shown in Table 3-5, 96 percent of episodes involve delivery or interpretation of a 12-lead EKG only. This is not surprising, since a rhythm EKG will yield only some of the information provided by a 12-lead EKG. Moreover, the 3-lead EKG is most useful in arrythmia monitoring over time; this type of testing occurs more frequently in the hospital than in an office setting. Although the proportion of episodes with a rhythm EKG only or with both types is quite small, there are substantial differences in the composition of these episodes. Episodes with rhythm EKGs only are least likely to include an office visit (66 percent compared to 80 percent for other episodes).

The level of intensity of the office visits identified in the EKG episodes is also of critical interest. The distinction between visits coded as either brief or minimal and other higher intensity visits is important because, according to the CPT manual, the latter include the evaluation of diagnostic tests and

Table 3-4

Average Number of Services for all EKG Office-Based Episodes and Percent of all Episodes with at Least One Service

	Total Number	Average Number per Episode/_a	Percent of Episodes with at Least One
Episodes	518,333	N/A	N/A
Bills for Services:			
Globals	461,811	0.89	86.5%
Interpretations	94,132	0.18	13.8%
Technicals	3,191	0.01	0.6%
Visits	432,576	0.83	79.0%
Physicians	548,650	1.06	100.0%

Note:

_a The average number of services presented on this table differs from the averages presented in Tables 3-2 and 3-3. This table's average number of services is obtained by dividing the number of services by the total number of episodes (518,333), rather than by only those episodes involving the specific service.

Source: Project HOPE Estimates based on the 1988 BMAD 5% Beneficiary File.

Table 3-5

Distribution of EKG Office-Based Episodes by Percent with Visit, Intensity of Visit, and Multiple Interpretations by Type of EKG

	Type of EKG		
	12-lead only	Rhythm only	Both
Percent distribution of episodes	95.9	2.3	1.8
Percent of episodes with visit	79.2	66.2	83.5
Percent of episodes with brief or minimal visit only (for episodes with visit)	3.9	9.3	5.4
Percent of episodes with more than one interpretation	3.1	4.3	98.6

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

procedures while the former do not. Of all office visits delivered in conjunction with EKGs, only 5 percent were coded as either brief or minimal. The fact that EKG interpretations are being billed in addition to these high intensity (and higher cost) office visits has important implications from a budgetary standpoint and is the central issue being explored in this project.

3.2.3 Distribution of Interpretations and Visits by Episode

As shown in Table 3-6, the vast majority of episodes -- 95 percent -- include billing for only one EKG interpretation.[3] Although the multiple interpretation episodes represent a small fraction of the overall total number of episodes (4.8 percent), there are several differences between the multiple and single interpretation episodes that are noteworthy.

Table 3-6 presents the average charge per episode for episodes with one, two, and three or more interpretations. The average charge per episode is comprised of two components, charges for EKGs and charges for visits. EKG charges rise with the number of interpretations but at a declining rate. Thus, the charge per EKG is lower when more than one interpretation is provided. One possible explanation is that multiple-interpretation episodes consist of a global bill plus another claim for interpretation only (the latter having lower allowed charges).

In contrast to this pattern, a decline in the visit component of the episode charges is seen as the number of interpretations increases. The relationship between the number of visits per episode and the number of interpretations per

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[3] Interpretation refers to billing for either a separate interpretation or a global claim (interpretation plus technical).

Table 3-6

Selected Variables by the Number of Interpretations per Episode:
EKG Office-Based Episodes

Selected Variables	Number of Interpretations per Episode		
	1	2	3 or more
Number of Episodes	493,600	18,906	5,827
(percent distribution)	95.2%	3.7%	1.1%
Average Charge per Episode			
EKG	$33	$46	$57
Visits	31	27	8
Average Charge per Visit	$36	$34	$27
Number of Visits per Episode (percent distribution)			
0	19.7%	36.7%	81.9%
1	76.6	48.6%	12.9
2 or more	3.7	14.8	5.1
Number of Physicians per Episode (percent distribution)			
1	94.9%	85.3%	78.9%
2	4.9	13.8	18.0
3 or more	0.2	0.9	3.1
Number of Technical Components per Episode (percent distribution)			
0	11.5%	30.5%	81.8%
1	88.5	8.0	6.7
2 or more	0.1	61.6	11.4

Source: Project HOPE estimates based on 1988 BMAD 5% beneficiary file.

episode indicates why there is a marked reduction in office visit charges. Close to half of the multiple interpretation episodes are not accompanied by an office visit. The single interpretation episodes, in comparison, are not accompanied by a visit only about 20 percent of the time. Although the majority of single- and two-interpretation episodes are accompanied by only one visit, this pattern does not hold up for episodes with more than two interpretations. In these cases, the majority of the episodes have no visits.

The average charge per visit within each type of episode (those with one vs. two vs. three or more interpretations) also falls as the number of interpretations per episode increases. This suggests that physicians are billing for lower intensity visits when they provide more EKG services, perhaps because follow-up visits require less physician time.

The number of visits per episode varied markedly depending upon the number of interpretations billed in the episode. For the majority of episodes (in which there was one interpretation), there was only one visit. However, almost 37 percent of the episodes with two interpretations billed included no visits and over 80 percent of the episodes with three or more interpretations included no bills for visits. While this finding is not easily explainable, it is possible that some factor not considered here, such as physician specialty, is driving this result.

The number of physicians per episode also varied with the number of interpretations per episode, though less dramatically than the number of visits. In the majority of episodes, there is only one physician billing. Episodes with more than one physician appear least frequently in the single interpretation category and most often in episodes with three or more interpretations as would be expected.

The frequency distribution of the number of technical components per episode varies considerably with the number of interpretations.[4] Of episodes with one interpretation, 88 percent also include one technical component. These represent the majority of episodes overall in which there is one global claim (here disaggregated into an interpretive and a technical component). In the case of episodes with two interpretations, the majority of episodes have two or more technical components but a substantial number have zero.[5] The situation in which one physician performs the procedure and interprets the results and another physician offers a second interpretation is not occurring with much frequency (it would be reported here as two interpretations and one technical); rather, the norm in these cases is for one physician to submit either two separate bills for interpretation or two global bills.

Table 3-7 indicates how these same factors vary with the number of visits per episode. Overall, three-quarters of the episodes were single-visit cases. However, a substantial proportion of these episodes (21 percent) had no visit billed.

Both components of average charge per episode -- those for EKG services as well as visit charges -- increased as the number of visits per episode increases. Thus, it appears that the number of EKG services provided increased along with the number of visits. The average charge for two or more visits was almost double the amount of a single visit.

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[4] The number of technical components includes those billed separately or those billed as part of a global service.

[5] Bills for the technical component may have been submitted by a hospital outpatient department and, thus, would not be found in the BMAD Beneficiary File.

Table 3-7

Selected Variables by the Number of Visits per Episode:
EKG Office-Based Episodes

	Number of Visits per Episode		
Selected Variables	0	1	2 or more
Number of Episodes	108,897	388,085	21,351
(percent distribution)	21.0%	74.9%	4.1%
Average Charge per Episode			
EKG	$26	$35	$40
Visits	0	37	68
Number of Interpretations per Episode (percent distribution)			
1	89.3%	97.4%	85.5%
2	6.4	2.4	13.1
3 or more	4.4	0.2	1.4
Number of Physicians per Episode (percent distribution)			
1	98.5%	96.6%	34.4%
2	1.4	3.4	60.8%
3 or more	0.1	0.0	4.8
Number of Technical Components per Episode (percent distribution)			
0	53.2%	2.2%	2.9%
1	45.4	95.7	83.3
2 or more	1.3	2.0	13.8

Source: Project HOPE estimates based on 1988 BMAD 5% Beneficiary File.

The distribution of the number of physicians is similar for episodes without any visits and for episodes with only one visit. The majority of these episodes include bills from only one physician. In the four percent of episodes with 2 or more visits, there is a greater likelihood of multiple physicians.

The distribution of the number of technical components per episode, when grouped according to visit frequency, shows the infrequency of multiple technical episodes. The majority of single and multiple visit episodes have only one technical component, and almost half of episodes with no visits have one technical component.

3.2.4 Variations in Billing Patterns by Specialty

In order to explore differences in the use of EKGs by those specialties frequently billing for them, each episode was linked to the specialty or specialties of the physician(s) billing for services within the episode.[6] While almost all specialties bill at least occasionally for EKG services, several specialties clearly predominate. As expected, internists, cardiologists, and general or family practitioners have the most billings for EKG-related services in the office setting. Internists are the most frequently-represented specialty, with charges in 47 percent of the episodes (see Table 3-8). Cardiologists have charges in 23 percent of the episodes, and family or general practitioners in 18 percent of the episodes. No other single specialty has billings for EKG-related services in more than two percent of episodes.

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[6] Physicians were linked to an episode for any claim submitted, either EKG (any procedural component) or a related visit. The distribution across specialties using this linkage is almost identical to that obtained considering interpretations alone.

Table 3-8

Average Allowed Charges Per Episode, Percent of Episodes with Visit and Distribution of EKG Office-Based Episodes by Specialty _a

Specialty	Allowed Charges	Percent of Each Specialty's Episodes with Visit	Percent of Total Episodes with Bill in Specialty
Internal Medicine	$66	84.1%	47.1%
Cardiology	$58	68.8%	23.0%
Family or General Practice	$57	90.4%	18.0%
Surgery	$48	87.4%	1.3%

Note:

_a Episodes are attributed to specialties of physicians billing for EKGs (any procedural component) or related visits in the episodes. Episodes in which more than one specialty submitted claims were counted once for each specialty represented.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

Internists have the highest average allowed charges per episode ($66) as shown in Table 3-8. Cardiologists and family or general practitioners all have average allowed charges of approximately $58 per episode; charges for surgeons are only $48 per episode.

There are several possible explanations for the differences in allowed charges across specialties. First, these charges include reimbursement for both visits and all procedural components of EKGs and, therefore, reflect an average number of visits and interpretations per episode. In terms of the difference between internists and cardiologists, one factor might be the combination of visits and interpretations within the typical episode; a much greater proportion of episodes with internists include a visit than those linked to cardiologists (84 percent compared to 69 percent). However, this explanation does not suffice for other specialties; although the percentage of episodes with visits are similar for surgeons and internists, their allowed charges differ by more than 25 percent.

The differences in allowed charges between specialties may be attributable, at least in part, to differences in billing for global versus interpretation services. Cardiologists and internists are more likely than other specialties to bill for global services (Project HOPE, 1991); this may be because they are most likely to have EKG equipment in their offices. The specialties also differ in their use of the brief, limited, intermediate, extended and comprehensive visit codes. Internists bill for comprehensive visits more frequently than other specialties (31 compared to 24 percent of visits). The allowed charge for an internal medicine comprehensive visit is, on average, 60 percent higher than the internist's average office visit charge of $36. In addition, allowed charges for visits differ by specialty with internists and cardiologists generally

being reimbursed at a higher rate for a given type of visit than general and family practitioners (data not shown).

The percentage distribution of physician specialty in episodes with one interpretation closely resembles the specialty distribution over all episodes (see Table 3-9). This is not surprising since only office-based episodes are considered here; 96 percent of these episodes have only one interpretation. It is likely that patients requiring multiple EKGs would be found in an inpatient setting.

Only three percent of office-based episodes have two interpretations (Table 3-10). Internists and cardiologists account for most of these episodes. In 91 percent of cases, these multiple interpretations are billed by the same specialty. Thus, the situation in which one physician administers and interprets an EKG and then refers the patient to a specialist for a second interpretation is not common. In fact, in the episodes with two interpretations and only one specialty, the vast majority have only one physician billing. Among episodes linked to cardiologists, 6 percent have two physicians billing; all the other specialties have smaller proportions with two physicians. It appears, then, that most of the two-interpretation episodes are repeated interpretation attempts by the same physician. Clinical indications for multiple interpretations in an office-based setting are relatively uncommon. The lack of referral pattern suggests that these cases may be failed EKG terminal connections; that is, the EKG was difficult to read or interpret the first time so a second attempt was made and billed. While these multiple interpretations do not account for a large proportion of all office-based EKGs, it is not clear what reimbursement policy in these cases should be. If a second test is not clinically indicated, limiting reimbursement might be appropriate.

Table 3-9

Specialty Distribution of EKG Office-Based Episodes with One Interpretation _a

Specialty	No. of Episodes	Percent
Internal Medicine	232,116	46.5
Cardiology	113,066	22.6
Family or General Practice	85,243	17.1
Surgery	4,617	0.9
Other _b	64,207	12.9
	499,249 _c	100.0

Notes:

_a Interpretation refers to a bill for either an EKG-Interpretation or an EKG-Global.

_b Other refers to multi-specialty group practices in addition to solo practices of specialties not listed here.

_c There are 493,600 rather than 499,249 episodes with one interpretation. Some episodes are double-counted as they are linked to more than one specialty.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

Table 3-10

Specialty Distribution of EKG Office-Based Episodes with Two Interpretations _a

Specialty	No. of Episodes	Percent
Both Internal Medicine	6,236	37.9
Both Cardiology	3,647	22.1
Both Family or General Practice	2,810	17.1
Both Surgery	182	1.1
Both Other _b	2,174	13.2
More than one Specialty	1,418	8.6
	16,467 _c	100.0

Notes:

_a Interpretation refers to a bill for either an EKG-Interpretation or an EKG-Global.
_b Other refers to multi-specialty group practices in addition to solo practices of specialties not listed here.
_c 16,467 constitutes 3 percent of the 518,333 episodes in this study.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

3.2.5 Variations in Billing Patterns by Carrier and Region

Since individual carriers employ practices which may influence observed billing patterns, it is important to investigate differences among carriers. Approximately 14 percent of carriers uniformly use global charges for 12-lead EKGs, a relatively low proportion when compared with other diagnostic procedures (Project HOPE, 1991). In addition, the proportion of episodes for which a visit was billed varied by carrier. The mean number of episodes with a visit per carrier was 78 percent. The range, however, was from a low of 36 percent to a high of 90 percent. In other words, one carrier had only 36 percent of its episodes containing visits while, at the other extreme, 90 percent of another carrier's episodes contained visits. It is not clear whether these differences reflect geographic practice patterns or carrier practices.

In order to examine whether billing patterns vary by locality, the EKG episodes were grouped by U.S. Census region.[7] Selected information about EKG episodes by geographic region is presented in Table 3-11. Almost two-thirds of all episodes take place in the South and Northeast combined. While the South accounts for approximately 34 percent of both the elderly population and the number of episodes in our analysis, a disproportionate number of episodes occur in the Northeast (22 percent of the elderly population and 30 percent of episodes). Episode charges are 20 percent higher than the national average in the West and 20 percent lower than the national average in the North Central region. The reported frequency of office visits in conjunction with EKG services is somewhat lower for the North

[7] Episodes were first mapped to one or more carriers and then from carrier to region. Episodes can thus be assigned to more than one region. In addition, episodes involving Railroad Retirement Program beneficiaries do not map to any region and were excluded from the total.

Table 3-11

Average Allowed Charges per Episode and Percent of Episodes with Visit by Region:
EKG Office-Based Episodes

	Number of Episodes	Average Allowed Charges per Episode	Percent of Episodes with a Visit
All Regions _a	518,339	$63	79.0
Northeast	157,503	$69	82.3
North Central	101,153	$52	73.9
South	173,597	$60	79.3
West	86,086	$76	78.4

Note:
_a Some episodes map to more than one carrier and may be linked to more than one region. In addition, episodes involving Railroad Retirement Program beneficiaries do not map to any region and were excluded from the total.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

Central region than for the other three regions. The lower frequency of office visits for this region may be one of the key variables limiting the North Central overall charge per episode.

3.3 Implications for Bundling

The descriptive statistics presented in the preceding section provide information helpful in examining the feasibility of various bundling strategies. Some of the key pieces of information presented in that section are as follows:

- 92 percent of bills for office-based EKG services were global;
- 79 percent of episodes had at least one visit;
- 96 percent of episodes had one interpretation only;
- only 5.5 percent of episodes involved more than one physician;
- only 5 percent of visits billed in conjunction with an EKG were coded as brief or minimal.

While the episodes can be characterized in a number of ways and a variety of different types of episodes can be observed, a picture does emerge of a "typical" episode. This episode consists of a global bill for both the technical and professional components of EKG services and one office visit, billed by one physician on one day. Such episodes account for just over two-thirds of all episodes and over 90 percent of episodes with at least one visit (see Table 3-12). This typical episode will be the central focus of the bundling analysis.

3.3.1 Bundling Strategies

The simplest bundling strategy is a combined reimbursement for a medical visit and the interpretation component of an EKG

Table 3-12

EKG Office-Based Episodes: Interpretation and Visit Billed by the Same Physician

Type of Episode		Number of Episodes	Percent of Same-Physician Episodes _a	
Number of Interpretations	Number of Visits		Case 1 _b	Case 2_c
1	1	378,150	97.8%	97.8%
1	2 +	18,255	95.3	28.8
2 +	1	9,935	91.1	81.8
2 +	2 +	3,096	96.6	67.9
TOTAL		409,436	96.7	93.3

NOTES:

_a Same physician defined as instances where both the specialty and provider ID are the same.

_b Case 1 are episodes where same physician bills for AT LEAST one interpretation and one visit.

_c Case 2 are episodes where the same physician bills for ALL interpretations and visits.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

ordered or performed as part of that visit. While this type of packaging will be the main focus of our analysis, a number of other potential methods of combining services for the purposes of reimbursement will be discussed briefly below. Issues related to bundling services across time (e.g., visit one day, interpretation the next), across physicians (e.g., visit by one physician, referral to another physician for interpretation), to include more than one interpretation by the same physician, and to include the technical component will be reviewed and discussed in the context of the data presented.

Of the 518,333 episodes constructed for this analysis, 21 percent included no visit at all and, therefore, have no potential for bundling interpretation and visit. The remaining 79 percent of episodes, all of which include at least one visit, are characterized in Table 3-12 by whether or not the same physician billed for both the interpretation(s) and the visit(s). Across all of the episodes listed, the same physician billed for at least one interpretation and one visit in over 90 percent of cases. In episodes with more than one visit, however, there was a greater likelihood of an additional physician submitting claims (i.e., fewer episodes have all interpretations and visits billed by one physician).

For episodes with at least one visit, 90 percent can be represented by the "typical" episode described above consisting of one EKG and one visit billed by one physician on one day. These cases require only the most straightforward of possible ways of bundling EKG services and medical visits. In these cases, reimbursement for interpretation of an EKG would be disallowed if provided along with a same-day visit by one physician. Charges for interpretation would be defined as either a claim for the interpretive component only or some portion of the global charge. Given the size of current payments for

interpretation relative to office visit fees, denial of these claims would reduce the typical reimbursement by 20 percent.[8]

As noted by Bogen et al. (1989), this sort of change in reimbursement practices would, in all likelihood, induce changes in physicians' billing practices. There are two likely reactions on the part of physicians to attempt to maintain their revenues. The first is to increase the visit intensity level billed (e.g., upcode from an intermediate to an extended visit) to compensate for the decrease in receipt of fees for interpretation. Another possibility is for the physician to bill for a brief visit in conjunction with the interpretation.

Assuming that the average reimbursement for interpretation is $14, coding a visit to the next higher intensity level could recapture between 36 and 93 percent of the disallowed interpretation fee depending upon the initial visit level.[9] Since only 13 percent of visits in the analysis are coded as extended, the 93 percent figure which is achieved by upcoding from extended to comprehensive, would be relatively infrequent. The range of potential reimbursement amounts for the average physician with and without bundling, are presented in Table 3-13. Clearly, a physician could recoup a larger proportion of the lost interpretation fee by upcoding the visit by more than one level. However, for the 24 percent of visits which are currently coded as comprehensive, no increase in intensity is possible. For limited visits, on the other hand, downcoding might be more

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[8] This assumes a global charge of $35 ($14 for interpretation) and a visit charge of $36 for total reimbursement of $71 before bundling and $57 afterwards.

[9] Average allowed charges for a limited visit were $24, for an intermediate visit $29, for an extended visit $38, and $61 for a comprehensive visit. To compute the percent recaptured through upcoding, simply divide the difference between two visit fees by the $14 interpretation charge.

Table 3-13

Average Allowed Charges Pre-Bundling and Post-Bundling
EKG Office-Based Episodes

Type of Visit	Percent Distribution of Visits	Allowed Charge (Visit Only)	Total Reimbursement for Visit and Global Chest Pre-Bundling_a	Total Reimbursement for Visit and Global Chest Post-Bundling_b
Brief or minimal	4.6%	$19	$54	$54
Limited	2.03	24	59	45
Intermediate	35.3	29	64	50
Extended	13.0	38	73	59
Comprehensive	24.1	61	96	82

Note:
_a Assumes $35 reimbursement for global claim, $16 for interpretation and $19 for technical component.
_b Assumes interpretation fee is disallowed when EKG is provided along with visit other than brief/minimal office visit.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

advantageous. While the visit fee would fall from $24 to $19, the physician could continue to bill for the interpretation.

Two additional possibilities would be for the physician to bill for the interpretation of the EKG on the day following the office visit or for the physician to administer and bill for more than one EKG. To legitimize the former practice, the physician could call the patient with results or formally note the interpretation in the medical record on the next day.

There is no evidence to indicate how widespread any of these reactions on the part of physicians might be. In terms of altering the level of visit billed, it is also not clear how to prevent such behavior. Stricter accounting of the content of visits could be required, but such a system would be administratively burdensome. Increases in the practice of billing on different days or for more than one EKG, on the other hand, could be ameliorated by the bundling strategies discussed below.

While the method of bundling payment for EKG interpretation described above is the simplest method as well as that specified in the OBRA '90 regulations, there are a number of other variants possible. Many of these have been discussed in Mitchell et al. (1987) and Miller and Sulvetta (1990) although those papers had a much broader focus and included a variety of different types of services. Specifically, in terms of EKG services, the four possibilities mentioned above are as follows:

- o bundling across time;
- o bundling multiple professional components;
- o bundling across physicians;
- o bundling the technical component.

The strategy of bundling across time has been proposed with respect to a number of different procedures. Surgical procedures seem particularly suitable, with one payment for pre-surgical evaluation, the surgery itself, and post-operative follow-up. The proposed time periods have been quite extensive. Bundling across time for EKG services would have a much narrower focus as any related services would be provided within a period of a few days. While the data presented in Section 3.2 make clear that the majority of related services are provided on the same day, bundling across time is worth considering for two reasons. First, while it may represent a relatively small proportion of cases, expanding the timeframe within which to package services would be relatively straightforward to accomplish. Moreover, if reimbursement rules focused only on same-day interpretation and visits, it would be quite simple for physicians to maintain their reimbursement by altering their billing or practice patterns to bill over more than one day. Thus, bundling across time could be a deterrent to potential gaming of the system. While it doesn't account for a large proportion of cases overall (0.7 percent), we have included episodes which span more than one day in the savings estimates presented in the next section.

Another possibility for packaging of services includes those situations in which a single physician bills for more than one EKG interpretation. As indicated earlier, the clinical indications for such provision of services are quite unusual and this is more likely to be a case of an unsuccessful or incomplete EKG reading on the first attempt. While it is not clear whether these are inappropriate billings altogether, it would seem feasible to include all professional services required in the delivery of the EKG within the package of services. Thus, bundling services to include more than one interpretation by the same physician has also been included in the estimates; these

episodes account for 2.6 percent of those with some bundling potential.[10]

Bundling services across physicians is somewhat more complex. Theoretically, one might want to consider bundling in the cases where a patient was given an EKG by one physician (who billed for a visit) and, then, referred to a specialist for the (or a second) interpretation. By making the payment to the primary physician only, this sort of bundling would ensure that the financial risk of excessive consultations would be borne by the primary physician; the decision maker would then bear the costs of ordering additional services. Currently, however, this referral pattern does not seem to be a widespread practice. For episodes consisting of one EKG and one visit, only 3 percent involve two physicians. And, overall, for episodes with more than one interpretation, only nine percent involve more than one specialty (see Table 3-10). While Mitchell et al. (1987) contend that one of the contributing factors to growth in costs has been the involvement of multiple physicians, this does not seem to be the case for EKG services provided in an office setting. Considered along with the inherent complexity of having one physician responsible for reimbursing another, we have not included bundling for more than one physician in our savings estimates.

The possibility of including the entire EKG service (both the professional and technical components) in the reimbursement package is conceptually appealing. Since the vast majority of EKG services are billed globally, physicians are already accustomed to receiving one payment for delivery and interpretation. The problem, however, arises in terms of the

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[10] Bundling multiple professional components with a single visit may demand consideration of packaging multiple professional components billed without a visit. This has not been explored in the current analysis.

size of the payment. On average, the current reimbursement for a global EKG is approximately equal to that for an office visit. Thus, inclusion of both components in the visit fee would reduce reimbursement by 50 percent on average, quite a significant drop. The determination of whether such a reduction is justifiable hinges on a number of factors; the critical issue would seem to be the cost involved in delivering the service -- the cost of purchasing, maintaining, and operating an EKG machine.[11] Of course, visit fees could be adjusted to account for a variety of diagnostic tests and procedures; this could add considerably to the reimbursement system's complexity and might not result in appreciable cost savings.

3.3.2 Estimates of Savings from Bundling

Estimates of the savings which would be realized through bundling of EKG interpretation and medical office visits are presented in Table 3-14. The basic premise is that physicians would not be reimbursed for the interpretation component of EKGs when delivered in conjunction with an office visit. Two different estimates were calculated, a lower and an upper bound. This was necessitated by the complexity of linking visits and EKGs within the episodes. Four different types of episodes were considered as potential sources of savings from bundling, as follows:

(1) Episodes with 1 EKG and 1 visit by the same physician on the same or adjacent days;

(2) Episodes with 2 or more EKGs and 1 visit where at least one EKG and one visit were billed by the same physician;

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[11] We are assuming that, since most EKGs are billed globally, the majority of physicians own and operate their own equipment.

Table 3-14

Estimate of Savings from Bundling Reimbursement of EKG Interpretation with Office Visit Fee, by Specialty, Region, and EKG Type

	Lower bound estimate_a	Upper bound estimate_b
Savings		
All Medicare beneficiaries_c	$104,060,220	$114,161,600
5% sample	$5,205,011	$5,708,080
Region		
Northeast	$1,849,965	$1,978,339
North Central	$799,296	$896,856
South	$1,587,771	$1,770,410
West	$967,725	$1,062,159
Specialty		
General/Family Practice	$939,059	$1,036,938
Surgery	$46,579	$53,131
Cardiology	$1,076,454	$1,213,899
Internal Medicine	$2,583,061	$2,785,896
Other	$559,858	$618,215
EKG Type		
12 Lead Only	$5,031,751	$5,504,994
Rhythm	$44,087	$53,409
Both	$129,173	$149,680

Notes:

_a The percent savings indicated by the lower bound are estimated by adding the average allowed EKG interpretation charges and 40 percent of the EKG global allowed charges for the 380,083 episodes where the same physician performs all of the interpretations and visits in the episodes and for which the visit intensity is more than brief.

_b The percent savings indicated by the upper bound are estimated by adding the average allowed EKG interpretation charge and 40 percent of the EKG global allowed charges for the 396,143 episodes where the same physician performs at least one interpretation and one visit.

_c Estimate for the 5% beneficiary sample multiplied by a factor of 20.

Source: Project HOPE estimates based on the 1988 EMAD 5% Beneficiary File.

(3) Episodes with 1 EKG and 2 or more visits where at least one EKG and one visit were billed by the same physician;

(4) Episodes with 2 or more EKGs and 2 or more visits where at least one EKG and one visit were billed by the same physician.

The upper bound estimate is the least restrictive and includes all episodes in the four categories listed above. It may overstate potential savings by including some situations in which a second EKG interpretation counted as part of savings was, in fact, billed by another physician who would be entitled to reimbursement. Some of the estimated savings may also be from interpretations linked to brief or minimal visits; these should also be reimbursed and not counted as part of savings.

The lower bound estimate, on the other hand, may understate potential savings. It includes only episodes in which all visits were billed at a limited level or higher, so that some episodes including more than one type of visit may have been incorrectly excluded. The lower bound estimate excludes all episodes that involve more than one physician, even if a single physician billed for at least one visit and EKG. For the episodes included in each of the lower and upper bound estimates, the savings estimates are equal to 40 percent of all global fees plus 100 percent of all interpretation fees.[12]

The savings from disallowing fees for interpretation of an EKG is estimated to be between $5.2 and $5.7 million for the 5 percent BMAD sample or from $104 to $114.2 million for the entire Medicare beneficiary population (see Table 3-14). Taken as a

[12] The percentage of global charges that are accounted for by interpretation is assumed to be 40 percent. This estimate is derived from the ratio of total allowed charges to total services presented in Table 1.

proportion of all Medicare outlays on EKGs and related visits delivered in a physician's office, this represents between a 15.8 and 17.3 percent reduction in reimbursement. These estimates do not account for any change in physician billing practices in response to the implementation of bundling.

3.3.3 Impact by Specialty and Region

Estimated savings by region are distributed quite similarly to the number of episodes by region as reported in Table 3-12. While the Northeast accounted for only 22 percent of the elderly population and 30 percent of episodes, 35 percent of total savings would come from that region. This is probably due to the slightly higher proportion of episodes including visits in that area. Just under one-third of savings are attributable to the South, with 16 and 19 percent from the North Central region and the West, respectively. In terms of all EKG services and related visits provided in each region, the reduction in reimbursement from packaging interpretation and visits is presented in Table 3-15. The expected reduction in revenues is somewhat higher than the nationwide average in the Northeast (18.3 compared to 17.3 percent for the upper bound estimates) and slightly lower in the West (16.2 percent).

The distribution of savings by specialty is also quite similar to the distribution of episodes across specialties. As shown in Table 3-14, almost half of the estimated savings in Medicare revenues would come from internists; another two-fifths of the total savings are accounted for by cardiologists and general or family practitioners. General and family practitioners would face the highest percentage reduction in reimbursement for EKG-related services -- 19.4 percent for the upper bound estimate. This can be explained in part by the higher proportion of episodes with visits delivered by those specialties.

Table 3-15

Effect of Bundling EKG Interpretation with Office Visit Fee on Reimbursement Levels by Region and Specialty

	Lower bound estimate	Upper bound estimate
Percent reduction in reimbursement_a		
Total	15.8%	17.3%
Region		
Northeast	17.1%	18.3%
North Central	15.3%	17.2%
South	15.3%	17.0%
West	14.7%	16.2%
Specialty		
General/Family Practice	17.7%	19.4%
Surgery	13.8%	15.8%
Cardiology	15.6%	17.6%
Internal Medicine	16.0%	17.2%
Other	14.3%	14.7%

Note:

_a The percent reduction in reimbursement is calculated by taking the savings noted for each category (overall, region, and specialty) in Table 14 and dividing these totals by the overall charges for all episodes in these categories.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

The impact of bundling services on various specialties should be viewed with some caution. First, these percentage reductions in reimbursement apply only to office-based EKG-related services and, thus, may represent only a small proportion of a physician's overall income. Second, the figures discussed represent an average change for the entire specialty; however, individual members of that specialty have a variety of billing patterns and there will be winners and losers within each group.[13]

Furthermore, individual physicians may "win" on some patients and "lose" on others. In order to provide more detailed estimates of the impact across and within specialties, it would be necessary to examine all of the claims submitted by a given set of physicians rather than all of the claims of a given set of beneficiaries. Without such an analysis, it is not clear what proportion of a physician's practice is comprised of EKG-related services delivered in the office setting and, therefore, what impact the implementation of the bundling policy discussed here would have on total physician revenues for a given physician.

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[13]See, for example, Levy et al. (1990) for a discussion of the impact of the Resource Based Relative Value Scale by specialty and geographic area.

4. ANALYSIS OF BILLING FOR EKG'S IN AN INPATIENT SETTING

4.1 Introduction

The purpose of this section of the report is to describe the analysis of billing patterns for EKGs that are performed in a hospital setting. As with the examination of office-based EKGs, the underlying aim is to determine the desirability and feasibility of bundling reimbursement for the interpretation of an EKG and a medical visit when these two services are provided jointly.

Given the frequency of visits received by a hospital inpatient together with the potential for multiple physicians providing care in this setting, the issue of bundling reimbursement for services is quite complex. Not only will there be a number of different arrangements under which the services are provided, but the way in which each situation is represented by available data may differ. For example, a patient receiving an EKG may have the following billing records: (i) a bill for a physician visit only; (ii) a bill for a physician visit and a bill for the professional component of an EKG, both from the same physician; (iii) a bill for a physician visit and a bill for the professional component of an EKG, each from different physicians.[19]

In addition, there might be interpretations billed by more than one physician. Moreover, visits unrelated to the EKG could be billed on the same day, or interpretations and related visits could be billed on different days.

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[19] There should be no global or technical component claims in the hospital setting, since the technical component is part of a hospital's overhead and is covered in the Medicare Part A payment to hospitals. We did, however, find a small proportion of these claims.

As with EKGs billed in a physician's office, examination of billing patterns is further complicated by variations in carrier practices. The use of modifiers, as discussed in Section 2.2, varies across carriers, and, thus, observed differences in billing by procedural component may be artificial. In addition, individual carriers may have rules governing some of the specific situations described above.

The following section provides a variety of descriptive statistics to aid in understanding physician billing patterns for EKGs and related inpatient visits. The initial section (4.2.1) provides general information on the size of these billings, the services which make up an episode and a hospital stay, and the services received by an average beneficiary. Section 4.2.2 is a more in-depth look at the episodes we have constructed, with detailed information on the number of EKG-related services by diagnostic category, the number of visits, the number of physicians, and the charges for each type of service delivered. The final two sections examine variation in episode characteristics and billing patterns by physician specialty and U.S. Census region. All of this descriptive information was used in establishing the approach to bundling of services described in Section 4.3 of the report.

4.2 Findings

4.2.1 Allowed Charges and Number of Services

Total allowed charges for all EKGs delivered in an inpatient setting and related inpatient physician visits were $16.2 million for the 1988 5 percent BMAD sample. When adjusted by a factor of 20 to represent the entire Medicare beneficiary population, total allowed charges for these services were approximately $324 million. As shown in Table 4-1, these charges were divided

Table 4-1
Total Allowed Charges and Number of Services for EKGs
Billed in an Inpatient Setting

	EKG-Related Services	EKG				Visits
		All	Global	Interpretation	Technical	
Total Allowed Charges	$16,217,920	$8,004,058	$562,356	$7,368,040	$73,661	$8,213,862
Percentage of All Charges	100%	49.4%	-	-	-	50.6%
Percentage of EKG	-	100%	7.0%	92.1%	0.9%	-
Total Services	814,670	611,707	20,652	587,928	3,127	202,963
Percentage of All Services	100%	75.1%	-	-	-	24.9%
Percentage of EKG	-	100%	3.4%	96.1%	0.5%	-
Ratio of Charges to Services (Average Charge per Service)	$20	$13	$27	$13	$24	$40

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

almost evenly between EKG services and visits. In terms of the total number of services delivered, however, three-quarters were for EKG services and only one-quarter for physician visits. Thus, the ratio of charges to services shown for visits is slightly over three times that for the EKG services provided ($40 vs. $13).

The distribution of charges and services by EKG procedural component shows that over 90 percent of all inpatient EKG charges and 96 percent of services are for the professional (interpretation) component only. The technical component of an EKG delivered to a patient in a hospital should be included in the Medicare Part A payment to the hospital; thus, the 3.9 percent of bills that we report here as either global claims or for the technical component only are something of an anomaly. One possibility is that they are due to carrier practices with regard to use of modifiers (e.g., a claim for interpretation only is submitted without the appropriate modifier).

Average allowed charges and average number of services are presented in Tables 4-2 through 4-4 at the beneficiary, admission, and episode level. As shown in Table 4-2, beneficiaries with at least one EKG in an inpatient setting received an average of 3.1 EKGs and 5.6 related visits annually. The average allowed charges per beneficiary were $226 for visits and $38 for the EKG interpretations.

The admission-level information presented in Table 4-3 indicates that 2.2 EKGs were administered, on average, per admission. The lower number of EKG interpretations per admission compared to the beneficiary level shows that a substantial percentage of beneficiaries have multiple admissions. Both average allowed charges and the services per beneficiary are 1.4 times that of the per admission frequencies.

Table 4-2
Average Allowed Charges and Average Number of Services
for Beneficiaries Receiving a Given Procedural Component or Visit:
EKG Inpatient Episodes

	EKG-Related Services	EKG				Visits
		All	Global	Interpretation	Technical	
Average Allowed Charges per Beneficiary_a	$81.27	$40.11	$36.83	$37.84	$29.81	$225.74
Average Services per Beneficiary_b	4.1	3.1	1.4	3.0	1.3	5.6

Notes:

_a Average allowed charges per beneficiary are the total allowed charges for a given procedural component or visit (e.g., total global allowed charges) divided by the total number of beneficiaries having that type of charge.

_b Average allowed services per beneficiary are the total services for a given procedural component or visit (e.g., total global services) divided by the total number of beneficiaries having that type of service.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

Table 4-3
Average Allowed Charges and Average Number of Services
per Admission with a Given Procedural Component or Visit
EKG Inpatient Episodes

		EKG				
	All EKG-Related Services	All	Global	Interpretation	Technical	Visits
Average Allowed Charges per Admission_a	$58.70	$28.97	$34.16	$27.41	$26.92	$182.60
Average Number of Services per Admission_b	2.9	2.2	1.3	2.2	1.1	4.5

Notes:

_a Average allowed charges per admission are the total allowed charges for a given procedural component or visit (e.g., total global allowed charges) divided by the total number of admissions with that type of charge.

_b Average allowed services per admission are the total services for a given procedural component or visit (e.g., total global services) divided by the total number of admissions with that type of service.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

A total of 363,073 inpatient EKG episodes were created, with an average of 1.8 episodes per beneficiary with an inpatient EKG-related service. The charges and number of services for these episodes is presented in Table 4-4. Averages presented in Table 4-4 are for episodes with a given procedural component only; for example, the $164 average allowed charge for visits is derived by dividing all visit charges by the number of episodes with visits. Thus, episodes with visits included 4.1 visits, on average, with a charge per visit of $40 ($164/4.1). Average allowed charges for all services included as part of the episode were $45; the average number of services per episode was 2.2, representing approximately 1.7 EKG interpretations and 0.6 visits.

4.2.2 An Overview of the Episodes

The majority of the remaining analysis is performed at the episode level, in order to make the connection between EKGs and related visits required for the analysis of bundling. While the construction of episodes is described in detail in Section 2.4., one difference between the formation of the office episodes and inpatient episodes should be reiterated. Due to the large number of visits received in an inpatient setting, inpatient visits were required to have the same physician and specialty identifiers as the EKG anchor record to be included in the episode. Thus, the inpatient episodes are somewhat less likely to include an EKG and visit performed by different physicians.

Table 4-5 presents additional information about the frequency of services and average allowed charges for EKG episodes as well as the diagnosis-related group (DRG) for the admission. While the averages in Table 4-4 include only those episodes with the particular EKG component or visit, the information presented in Table 4-5 accounts for all of the episodes, regardless of whether a particular service is provided. When taking into account all of the episodes, the number of

Table 4-4
Average Allowed Charges and Average Number of Services
per Episode with a Given Procedural Component or Visit:
EKG Inpatient Episodes

		EKG				
	All EKG-Related Services	All	Global	Interpretation	Technical	Visits
Average Allowed Charges per Episode_a	$44.67	$22.05	$32.39	$20.91	$25.73	$164.01
Average Number of Services per Episode_b	2.2	1.7	1.2	1.7	1.1	4.1

Notes:

_a Average allowed charges per episode are the total allowed charges for a given procedural component or visit (e.g., total global allowed charges) divided by the total number of episodes having that type of charge.

_b Average allowed services per episode are the total services for a given procedural component or visit (e.g., total global services) divided by the total number of episodes having that type of service.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

Table 4-5
EKG Inpatient Episodes: Diagnoses, Charges, and Services_a

Diagnosis-Related Group	Percent Distribution of Episodes	Average Allowed Charges	Number of Inter-pretations	Number of Visits
All (N = 363,073)	100%	$45	1.7	0.6
Cardiovascular Medical				
Heart-related	21.4%	58	2.1	0.7
Non Heart-related	1.3	44	1.4	0.7
Cardiovascular Surgical				
Heart-related	7.7	48	2.1	0.5
Non Heart-related	0.9	37	1.5	0.5
Other Medical	42.0	40	1.4	0.6
Other Surgical	19.1	32	1.3	0.4
Other/Unknown	7.7	63	2.5	0.7

_a Averages presented in this table may differ from those in Table 4-4. These averages are taken over all episodes rather than only those episodes involving the specific service.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

visits is fairly infrequent -- less than one visit, on average, for each episode. Overall, there are 1.7 EKG interpretations billed per episode.

Episodes are also classified according to DRG categories in Table 4-5. The majority of EKG episodes (65 percent) are part of a medical hospital stay; approximately 28 percent are part of a surgical admission. Overall, almost one-third of episodes are cardiovascular-related.

Average allowed charges per episode vary somewhat by DRG category. Episodes with a cardiovascular medical, heart-related DRG have allowed charges that are $13, or 30 percent, higher than the average for all DRG episodes ($58 compared to $45). In contrast, the average allowed charge for episodes with non-heart related cardiovascular surgical DRGs is $8 lower than the average allowed charge for all episodes. As might be expected, the heart-related DRGs have a greater number of EKG interpretations per episode.

Thirty-one percent of inpatient episodes included more than one EKG interpretation (see Table 4-6); as described in Section 2.4, there can be more than one EKG within an episode if the EKGs were on the same or adjacent days. This contrasts with only 5 percent of office-based episodes which included more than one EKG interpretation. It is likely that persons receiving EKGs in an inpatient setting are more likely to be experiencing an acute illness and, thus, require more than one EKG for monitoring or re-evaluating a condition.

As shown in Table 4-6, average charges per episode -- both for EKG services and for physician visits -- rise with the number of interpretations per episode. This is due to the higher number of services obtained in these types of episodes. In fact, the average charge <u>per visit</u> within an episode varies little so that

Table 4-6: Number of Interpretations per Inpatient EKG Episode

	Number of Interpretations		
	1	2	3+
Number of Episodes	251,075	52,086	59,912
(percent distribution)	69.2%	14.3%	16.5%
Average Charge per Episode			
EKG	$13	$27	$55
Visit	$17	$27	$44
Average Charge per Visit	$39	$41	$43
Number of Visits per Episode			
0	88.4	83.3	79.7
1	3.0	3.4	3.2
2+	8.6	13.3	17.0
Number of Physicians per Episode			
1	100.0	87.5	79.6
2	0.0	12.5	17.7
3+	0.0	0.0	2.8

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

it appears that the level of visit billed does not change with the number of interpretations per episode.

The number of visits per episode and the number of physicians involved in an episode also vary somewhat according to whether the episode includes one, two, or three or more interpretations. In terms of the number of visits per episode, the likelihood of a physician billing for an interpretation but not billing for any visits decreases as the number of interpretations increases. The proportion of episodes with multiple visits increases with the number of interpretations billed. While the probability of having more than one physician involved in an episode increases with the number of interpretations, it is interesting to note that, even for episodes with three or more interpretations, 80 percent involve a single physician.

The impact of the type of care unit (intensive vs. nonintensive) on the charges and services per EKG episode is presented in Table 4-7. Episodes including days spent in the intensive care unit accounted for approximately half of all episodes. Charges were higher and the number of services greater for those episodes that included intensive care days: the average number of interpretations was 43 percent higher (2.0 vs. 1.4 interpretations) and corresponding charges for EKGs were 44 percent higher ($26 compared to $18). It is likely that much of the ICU use is in a cardiac unit where patients may have EKGs performed more frequently to determine if their condition has improved or worsened.

4.2.3 Variations in Billing Patterns by Specialty

As was done for the office-based episodes, inpatient EKG episodes were linked to the specialties of all physicians billing for an EKG or a visit within the episode. The distribution of

Table 4-7: Intensive Care and Non-Intensive Care Charges and Services for EKG Inpatient Episodes

Type of Stay	Percent of Episodes	EKG Interpretations		Visits	
		Number of Services	Average Allowed Charges	Number of Services	Average Allowed Charges
With Intensive Care Days	50.8	2.0	$26	0.6	$25
With no Intensive Care Days	49.2	1.4	$18	0.5	$20

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

episodes by physician specialty is shown in Table 4-8. Over two-thirds of episodes involved either cardiologists (39.4 percent) or internists (31.9 percent). Only 4 percent of episodes included a bill from a general or family practitioner.

Average allowed charges per episode varied substantially by specialty. This variation in charges appears to be directly related to specialty differences in the percentage of episodes with at least one visit -- cardiologists had both the lowest average charges ($33) and the lowest percentage of episodes with a visit (6.8 percent) compared to general and family practitioners who had the highest in both categories ($76 and 38.2 percent). Average allowed charges for internal medicine were $56, with approximately 20 percent of episodes including at least one visit.

4.2.4 Variations in Billing Patterns by Carrier and Region

As discussed earlier, there are a number of practices which vary widely by carrier; thus, it is important to explore observed differences in billing across carriers in order to help determine the source of the variation. Overall, only 13.8 percent of the episodes are accompanied by a visit. In fact, there is only one carrier where visits are included as part of the episode more than 50 percent of the time. For half of the carriers (n=28), episodes with visits appeared less than 10 percent of the time, and only 30 percent of the carriers had more than 20 percent of their episodes including visits.

Information about EKG episodes by geographic region is presented on Table 4-9. The largest portion of the EKG episodes -- 36 percent -- are from the South, while the West accounts for only 13 percent of the episodes. EKG episodes performed in the South have the highest average allowed charges per episode -- the allowed charges per episode in the South are somewhat higher

Table 4-8
EKG Inpatient Episodes: Percent Distribution, Average Allowed Charges, and Percent with Visit by Specialty

Specialty	Percent Distribution of Episodes_/a	Average Allowed Charges	Percent of Episodes with at Least 1 Visit
All (N = 383,994)	100%	$42	13.0%
General or Family Practice	3.6%	76	38.2%
Surgery	0.1	69	34.7
Cardiology	39.4	33	6.8
Internal Medicine	31.9	56	20.1
Other_/b	24.9	34	10.0

_/a Episodes are linked to specialties of physicians billing for EKG or visit. Episodes in which more than one specialty submitted claims were counted once for each specialty represented.

_/b "Other" refers to group practices of all specialties as well as solo practices of specialties not listed here.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

Table 4-9

Average Allowed Charges per EKG Inpatient Episode and Percent of Episodes with Visit by Region

	Number of Episodes	Average Allowed Charges per Episode	Percent of Episodes with a Visit
All Regions _a	363,002	$45	13.8
Northeast	91,611	$41	9.9
North Central	93,850	$45	16.2
South	129,810	$51	16.9
West	47,731	$35	8.0

Note:

_a Some episodes map to more than one carrier and may be linked to more than one region. In addition, episodes involving Railroad Retirement Program beneficiaries do not map to any region and were excluded from total.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

than the allowed charges per episode for all regions combined and over 40 percent higher than for those in the West. One factor in the difference in charges is that the South has a much greater percentage of episodes including a visit (16.9 percent compared to 13.8 percent overall).

4.3 Implications for Bundling

The descriptive statistics presented in the preceding section provide information helpful in examining the feasibility of various bundling strategies. Some of the key pieces of information presented in that section are as follows:

- 92 percent of claims for inpatient EKG services were for the professional component only;
- only 13.8 percent of episodes had at least one visit;
- 31 percent of episodes includes more than one interpretation;
- only 5.2 percent of episodes involved more than one physician;
- only 10 percent of visits billed in conjunction with an EKG were coded as brief or minimal.

Several of these findings contrast markedly with results from Section 3 on office-based services. First, the majority of claims for EKG services in the hospital are for the professional component only rather than for a global service. This is because the technical component of the EKG is covered in the Part A hospital payment while it appears that, for office-based services, most physicians own and operate their own EKG equipment.

More importantly, only 13.8 percent of inpatient episodes include a visit compared to 79 percent of office episodes. This may be due, in part, to the differences in the distribution of

physician specialty across settings; both internists and general and family practitioners are more likely to bill for a visit in conjunction with an EKG and these specialties account for a larger proportion of office-based EKG services than inpatient. It is also likely that much of the difference is attributable to variation in physician practice patterns (across all specialties) between the two settings; in general, an inpatient's care is more likely to involve a larger number of physicians, each assuming responsibility for a portion of patient care (e.g., interpreting an EKG).

4.3.1 Bundling Strategies

Strategies for bundling reimbursement for EKG services delivered to hospital inpatients are quite similar to those for office-based services, as discussed in Section 3.3.1 of this report. The basic packaging method described in that section is a combined reimbursement for a medical visit and the interpretation component of an EKG ordered or performed as part of that visit. Other issues discussed in that section relate to bundling services across time, across physicians, to include more than one interpretation by the same physician, and to include the technical component.

There are two instances where the bundling strategies described with respect to office-based services may not be applicable to a hospital setting. The first concerns the possibility of including the technical component in the reimbursement package; given that payment for the technical component is part of the Medicare Part A payment to the hospital, this approach would not make sense. The other case in which strategies for bundling inpatient- and office-based services should, perhaps, differ is when a physician bills for more than one interpretation along with only one medical visit. While the clinical indications for more than one EKG in a matter of days in

an office setting are questionable and may be due to an unsuccessful or incomplete first attempt, repeat EKGs are often clinically indicated in the hospital for monitoring a seriously ill patient's condition. Thus, it may be less appropriate to deny reimbursement for a second interpretation linked to a single visit in an inpatient setting.

While the other strategies described are applicable to a hospital setting, the results would be quite different in practice. In our analysis of office-based EKGs, roughly 70 percent of episodes consisted of one EKG and one visit billed by one physician on one day -- making these episodes candidates for the most straightforward bundling method. In contrast, only 13.8 percent of all inpatient episodes included a physician visit.[20] Clearly, the potential for bundling interpretations and visits is more limited.[21]

Relevant characteristics of these approximately 50,000 episodes which include a physician visit are shown in Table 4-10. Episodes are divided into four different categories by the number of interpretations and visits involved. According to the way in which the episodes were defined, any episodes in the first or third categories (either one interpretation and one visit, or one interpretation and more than one visit) involve only one physician.

Of those episodes with at least one visit, almost 80 percent include two or more physician visits. In the second category (2 or more interpretations and 1 visit), 34 percent include an

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[20] For an episode to include a visit, recall that a visit must be billed on the same day or an adjacent day to the EKG and by the same physician who has billed for the EKG.

[21] Other sorts of packaging -- such as a DRG-type payment to physicians which incorporates reimbursement for test interpretation -- are beyond the scope of this report.

Table 4-10

EKG Inpatient Episodes: Interpretation and Visit Billed by the Same Physician

Type of Episode		Number of Episodes	Percent with Same Physician_a
Number of Interpretations	Number of Visits		
1	1	7,473	100.0
2 +	1	3,724	65.9
1	2 +	21,636	100.0
2 +	2 +	17,132	81.6
TOTAL		49,965 _b	

NOTES:

_a Same physician denotes cases in which same physician bills for all interpretations and visits in episodes.

_b Represents 13.8 percent of total episodes (100 percent of episodes with at least one visit).

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

interpretation by a physician not billing for a visit. For episodes with two or more interpretations and two or more visits (the fourth group), over 80 percent involve a single physician.

The array of fees hypothetically available to a physician billing for an EKG interpretation and a medical visit are shown in Table 4-11. The distribution of all visits billed within the episodes is quite similar to that for office-based visits; the exception is in terms of the two extreme categories -- brief or minimal visits account for less than 5 percent of office-based visits and almost 10 percent in the inpatient episodes. Recall that the CPT manual expressly allows billing for interpretation of diagnostic tests along with a brief visit.

The reimbursement that a physician would receive for an EKG and a given level of inpatient visit before and after the imposition of a bundling requirement is also shown in Table 4-11. As described previously, for our purposes bundling implies that the fee for interpretation would be disallowed if provided along with a visit by a single physician. Assuming no changes in physician coding of visit intensity, total reimbursement would decline by up to 34 percent post-bundling.[22] However, as discussed in Section 3.3.1, there is a range of possible behavioral responses by physicians -- such as billing for a higher level of visit -- which are probably equally applicable to the inpatient setting.

4.3.2 Estimates of Savings from Bundling

In this section, we describe the methods used to calculate the savings which would be realized through bundling of EKG interpretation and physician inpatient visits. The assumption

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[22] The largest change would be for the visit level with the lowest original charge; thus, for a limited visit total reimbursement would fall by $13/$38 or 34 percent.

Table 4-11

Average Allowed Charges for EKG Inpatient Episodes: Pre-Bundling and Post-Bundling

Type of Visit	Percent Distribution	Allowed Charge (Visit Only)	Total Reimbursement for Visit and EKG Pre-Bundling_a	Total Reimbursement for Visit and EKG Interpretation Post-Bundling_b
Brief or minimal	9.7%	$25	$38	$38
Limited	23.5	25	38	25
Intermediate	36.2	35	48	35
Extended	11.8	43	56	43
Comprehensive	18.5	78	91	78

Note:

_a Assumes $13 reimbursement for interpretation (professional component only).

_b Assumes interpretation is disallowed when EKG is provided along with inpatient visit other than brief or minimal.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and Beneficiary File.

used throughout this report is that, with bundling of reimbursement, physicians would not be reimbursed for the interpretation component of EKGs when delivered in conjunction with a physician visit.

Upper and lower bound estimates of the savings are presented in Table 4-12. The upper bound estimate includes all EKG interpretations performed by a physician who has billed for a visit on the same or an adjacent day. If a physician has billed for one visit and several professional components, all of these interpretation claims are disallowed for the upper bound estimate. The lower bound estimate differs in two ways. The first is with regard to a physician who bills for more than one interpretation within an episode. For the lower bound estimate, only one interpretation is disallowed for each visit by a given physician. Second, any interpretations linked to brief physician visits are still considered to be reimbursable.

Disallowing reimbursement for EKG interpretations billed in conjunction with a physician visit would result in savings of approximately $1.3 to $1.4 million for the 5 percent BMAD sample. When this amount is increased by a factor of 20 to represent the total Medicare population, the savings to the Medicare program amount to approximately $25.9 to $28.5 million. Bundling payment for these types of interpretations with medical visits translates into an 8.6 to 9.6 percent reduction in Medicare outlays for these services.[23] Potential savings from bundling are substantially less in a hospital setting compared to an office setting, primarily because of the smaller proportion of visits billed in conjunction with an EKG.

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[23] The percentage reduction in overall reimbursement for EKG-related inpatient services is calculated by dividing the savings estimates by the total charges for services in all episodes.

Table 4-12

Estimate of Savings from Bundling Reimbursement of EKG Interpretation with Inpatient Visit Fee, By Region and Specialty

	Lower bound estimate\a	Upper bound estimate\b
Savings		
All Medicare beneficiaries\c	$25,855,180	$28,478,980
5% sample	$1,292,759	$1,423,949
Region		
Northeast	$ 322,082	$ 359,346
North Central	319,773	371,496
South	548,169	585,307
West	102,734	107,800
Specialty		
General/Family Practice	105,804	117,531
Surgery	2,354	3,291
Cardiology	329,813	356,823
Internal Medicine	650,955	712,347
Other	203,832	233,957

Notes:

\a The percent savings indicated by the lower bound are estimated by adding the average allowed EKG interpretation charges and 40 percent of the EKG global allowed charges for one EKG for each visit billed by the same physician within an episode and for which the visit intensity is more than brief.

\b The percent savings indicated by the upper bound are estimated by adding the average allowed EKG interpretation charge and 40 percent of the EKG global allowed charges for all EKGs in an episode billed by a physician also billing for a visit.

\c Estimate for the 5% beneficiary sample multiplied by a factor of 20.

4.3.3 Impact by Specialty and Region

The distribution of savings from bundling by region as well as the percentage reduction in reimbursement levels are presented in Tables 4-12 and 4-13. These figures are for the five percent sample of Medicare beneficiaries unless otherwise noted. In terms of absolute dollar amounts, the highest savings would be found in the South (over half a million dollars) and the West would contribute only $100,000 to overall Medicare savings. Savings attributable to the Northeast are estimated to be between $320,000 and $360,000. The comparable figures for the North Central region are $320,000 and $370,000. These differences can be explained primarily by two factors. First, one must consider the distribution of EKG-related services across regions. As shown in Table 4-9, the number of EKG episodes by region is quite uneven. Second, it is important to look at the percent of episodes with a visit. Those regions which have a higher proportion of visits are likely to lose more fees for interpretations.

The pattern across regions is somewhat different with regard to the percentage reduction in reimbursement. As a percentage of total reimbursement for EKG-related services, the Northeast region is likely to be the biggest loser from bundling of payment for interpretation and visits, while the West faces the lowest proportionate reduction in reimbursement.

The impact on different specialties is also shown in Tables 4-12 and 4-13. Of the major specialties involved in EKG-related services, reductions in payments to those practicing internal medicine comprise the largest contribution to savings. With implementation of this bundling strategy, payments to that

Table 4-13

Effect of Bundling EKG Interpretation with Inpatient Visit Fee on Reimbursement Levels by Region and Specialty

	Lower bound estimate	Upper bound estimate
Percent reduction in reimbursement\[a]		
Total	8.0%	8.8%
Region		
Northeast	8.6%	9.6%
North Central	7.6%	8.9%
South	8.3%	8.9%
West	6.1%	6.4%
Specialty		
General/Family Practice	10.0%	11.1%
Surgery	7.3%	10.2%
Cardiology	6.6%	7.2%
Internal Medicine	9.5%	10.4%
Other	6.2%	7.1%

\[a] The percent reduction in reimbursement is calculated by taking the savings noted for each category (overall, region, and specialty) in Table 4-12 and dividing these totals by the overall charges for all episodes in these categories.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

specialty could be reduced by as much as $14 million for the entire Medicare population.[24]

Two points should be noted. First, the estimates of the effect of bundling on reimbursement levels shown in Table 4-13 indicate the percentage of reimbursement for EKG-related services only, not as a percentage of the specialty's or region's total reimbursement. Thus, while the reduction in reimbursement to surgeons represents between 7 and 10 percent of that specialty's current reimbursement for these services, EKG-related services are probably a very small proportion of surgeons' total income from Medicare. Second, these percentage reductions in reimbursement do not mean an across-the-board decrease for all physicians of a particular specialty or region. Instead, the percent reduction represents an average for the entire specialty or region; however, within each specialty and region, particular physicians would gain and others would lose.

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[24] Multiply the upper bound estimate of $712,347 by 20 to extrapolate from the 5 percent sample to the entire beneficiary population.

5. ANALYSIS OF BILLING FOR CHEST X-RAYS IN AN OFFICE SETTING

5.1 Introduction

The purpose of this portion of the project is to examine billing patterns for chest X-rays that are delivered in a physician's office. The underlying aim is to determine the desirability and feasibility of bundling reimbursement for the interpretation of a chest X-ray and an office visit when these two services are provided jointly.

The issue is made more complex given the number of different arrangements under which these services can be provided and the way in which each of these situations may be represented by the available data. The most straightforward situation is when a patient goes to a physician's office for a visit, is administered a chest X-ray, and is informed of the results. This simple situation, however, may be represented by billing records in any of the following ways: (i) a bill for an office visit only; (ii) a bill for an office visit and a bill for the professional component of a chest X-ray; (iii) a bill for an office visit and a global bill for a chest X-ray (both the interpretive and technical components).

Other examples might be far more complicated. A physician could examine a patient, administer a chest X-ray, and then refer the patient to a specialist for follow-up treatment, which could include an interpretation. In this situation, either or both physicians might bill for a visit and/or the chest X-ray interpretation. Moreover, these services might or might not be provided on the same day or adjacent days. Given the idiosyncracies of the system of modifiers, it is not always possible to tell which situation occurred from billing records. Five different visit levels defined by the intensity of service add further to the range of possibilities.

From a policy perspective, the basic issue is whether or not it is appropriate to combine reimbursement for interpretation of the chest X-ray and the medical visit. A closely related issue is that of the payment for the technical component, particularly since the vast majority of bills for chest X-ray-related services provided in a physician's office are global bills. In other words, should a physician be allowed to bill for the technical component in addition to the visit but not for the interpretive component? Other issues (to be discussed in more detail in Section 5.5.1) concern bundling of reimbursement over time (visit on one day, test administered on the following day) and across physicians (visit by general practitioner, with follow-up chest X-ray and interpretation by radiologist, or visit by GP with an X-ray, and follow-up interpretation and treatment by cardiologist or pulmonologist).

Investigation of billing patterns is further complicated by variations in carrier practices. As described in Section 2.2, the use of modifiers varies across carriers and, thus, observed differences in billing by procedural component may be artificial. In addition, individual carriers may have rules concerning some of the situations described above which are not apparent from examining the data files.

The next section presents a variety of descriptive statistics as a step toward improving our understanding of billing patterns for chest X-rays and related visits in an office setting. The initial sections (5.2.1 and 5.2.2) provide general information on the size of these billings, the services comprising an episode, and the average level of services received by beneficiaries. Section 5.2.3 is a more in-depth look at the episodes we have constructed, with detailed information on the numbers of chest X-ray services by procedural component, the number of visits, the number of physicians, and related charges.

The final two sections examine variation in episode characteristics and billing patterns by physician specialty and U.S. Census region. This descriptive information lays the groundwork for assessing various approaches to bundling services, as described in Section 5.3 of this report.

5.2 Findings

5.2.1 Allowed Charges and Number of Services

Total allowed charges for chest X-rays delivered in a physician's office and related office visits, as well as the number of these services provided, are presented in Table 5-1. For the 5 percent BMAD sample in 1988, total allowed charges for these chest X-rays amounted to $10.7 million and the total number of chest X-ray services equaled 358,000. The chest X-ray total allowed charge figure, when adjusted by a factor of 20 to represent the entire Medicare beneficiary population, exceeded 200 million dollars. These charges represented 2.1 percent of the total allowed charges for Medicare-covered office-based services in 1988 (Project HOPE, 1990). Allowed charges for office visits linked to chest X-ray services and their frequency are also presented in Table 5-1. Charges (for the 5 percent sample) totaled $8 million, less than allowed charges for chest X-rays.

The distribution of charges by procedural component shows that the vast majority -- 87 percent -- of the office-based chest X-ray charges were for global chest X-rays. Separate interpretation charges accounted for 13 percent of the chest X-ray charges and technical component charges were infrequently reported in the office setting. The same ranking of procedural components is obtained when the distribution of the number of

Table 5-1

Total Allowed Charges and Number of Services for Chest X-Ray Episodes Billed in an Office Setting

	Chest X-Ray and Related Visits	Chest X-Ray				Visits
		All	Global	Interpretation	Technical	
Total Allowed Charges	$18,765,084	$10,696,388	$9,269,804	$1,385,175	$41,409	$8,068,696
Percentage		100.0%	86.7%	13.0%	0.3%	
Total Services	583,695	357,795	267,384	88,581	1,830	225,900
Percentage		100.0%	74.7%	24.8%	0.5%	
Ratio of Total Allowed Charges to Total Services	$32	$30	$35	$16	$23	36

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

services is examined, although only 75 percent of services are global. The frequency of global bills for chest X-rays indicates that, in actual clinical practice, the technical and interpretive components are performed simultaneously. This suggests that the majority of physicians providing office-based chest X-ray services have the necessary equipment located within their office.[1]

Average allowed charges and the average number of services at the beneficiary and episode levels are presented in Tables 5-2 and 5-5. These tables show the average charge and number of services -- global, interpretation, technical, and visit -- for each type of episode and beneficiary and do not describe a typical all-encompasing episode. At the beneficiary level, among those who had at least one visit, there were approximately 1.3 visits on average during 1988, with an average charge of $48 for visits. Approximately 1.5 chest X-ray services were provided to each of these beneficiaries. Combining visits and X-ray interpretations, recipient beneficiaries used 2.4 services per year in 1988 and average charges per beneficiary were $79.[2]

The number of chest X-ray claims (overall and by the procedural component) and the number of office visits each averaged approximately 1.1 per episode (see Table 5-3). Each episode consisted of 1.8 total services (chest X-ray and visit combined), however. Average allowed charges per episode were

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[1] It is possible that physicians who do not own their own equipment and, therefore, refer patients to a hospital outpatient department for X-rays also have the X-ray interpreted by the staff radiologist. Since these bills would not appear in our files, we would have no indication that the patient is receiving an X-ray in conjunction with the office visit.

[2] The services per beneficiary are the total services of a given type divided by the total number of beneficiaries having that type of service. For services per episode, the denominator is the total number of episodes in which that type of service is billed.

Table 5-2

Average Allowed Charges and Average Number of Services for Beneficiaries Receiving a Given Procedural Component or Visit: Office-Based Chest X-Ray Episodes

	Chest X-Ray and Related Visits	Chest X-Ray				
		All	Global	Interpretation	Technical	Visits
Average Allowed Charges per Beneficiary _a	$79.00	$45.00	$47.00	$28.00	$27.00	$48.00
Average Services per Beneficiary _b	2.4	1.5	1.4	1.8	1.2	1.3

Notes:

_a Average allowed charges per beneficiary are the total allowed charges for a given procedural component or visit (i.e., total global allowed charges) divided by the total number of beneficiaries having that type of charge.

_b Average allowed services per beneficiary are the total services for a given procedural component or visit (i.e., total global services) divided by the total number of beneficiaries having that type of service.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

Table 5-3

Average Allowed Charges and Average Number of Services for Office-Based Chest X-Ray Episodes with a Given Procedural Component or Visit

	Chest X-Ray and Related Visits	Chest X-Ray				Visits
		All	Global	Interpretation	Technical	
Average Allowed Charges per Episode _a	$58.00	$33.00	$36.00	$20.00	$23.00	$38.00
Average Services per Episode _b	1.8	1.1	1.0	1.3	1.0	1.1

Notes:

_a Average allowed charges per episode are the total allowed charges for a given procedural component or visit (e.g., total global allowed charges) divided by the total number of episodes with that type of charge.

_b Average services per episode are the total services for a given procedural component or office visit (e.g., total global services) divided by the total number of episodes with that type of service.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

$58; the charge per beneficiary was 1.4 times the average charge per episode, which is consistent with 1.4 episodes per beneficiary.

5.2.2 An Overview of the Episodes

There were 324,761 episodes constructed for 238,643 beneficiaries involving delivery of chest X-ray services in the office setting. Table 5-4 provides an overview of these episodes, including average number of services per episode. The denominator for these averages is all episodes rather than only those episodes with a given service, as in Tables 5-2 and 5-3. Thus, this is an overview of a typical episode. Almost eighty percent of episodes had at least one global bill -- the most frequent type -- and the mean number per episode was 0.82. Only 65 percent of episodes had at least one office visit and the mean number of visits per episode was 0.69. There were an average of 1.19 physicians submitting claims for each episode.

The somewhat low percentage of episodes with visits[3] can be explained at least in part by the involvement of radiologists who are less likely than the other practitioners to bill for a visit (see Section 5.2.4 for a more detailed discussion of variation in billing by specialty). The average number of physicians per episode is also lower than may have been expected, considering that all the radiology patients must have had a referring physician. Because the visit with the primary care physician which resulted in the referral may have been outside the window for inclusion in the episode, it may not be possible to count all of these referring physicians.

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[3] This is low in comparison to the proportion of EKG episodes with a visit -- 79 percent -- as indicated in Section 3 of this report.

Table 5-4

Average Number of Services for all Office-Based Chest X-Ray
Episodes and Percent of all Episodes with at Least One Service

	Total Number	Average Number per Episode/_a	Percent of Episodes with at Least One
Episodes	324,761	N/A	N/A
Bills for Services:			
Globals	267,384	0.82	78.9%
Interpretations	88,581	0.27	21.7%
Technicals	1,830	0.01	1.0%
Visits	225,643	0.69	65.0%
Physicians	388,016	1.19	100.0%

Note:

_a The average number of services presented on this table differs from the averages presented in Tables 5-2 and 5-3. This table's average number of services is obtained by dividing the number of services by the total number of episodes (324,761), rather than by only those episodes involving the specific service.

Source: Project HOPE Estimates based on the 1988 BMAD 5% Beneficiary File.

Table 5-5 shows the distribution of episodes by the type of chest X-ray billed: single view, 2 to 3 views, 4 or more views, special view, and combinations of the above. Over 75 percent of episodes involve X-rays that are 2 to 3 views. Visits most often occur in episodes with 2 to 3 views only: 70 percent of these, compared to only 22 percent of episodes with special views, include a visit. This may be due to the specialty of the interpreting physician. As mentioned earlier, radiologists do not tend to include a visit with their interpretation, and are likely to be performing the more detailed films. Single view episodes are the second most common, accounting for 23 percent of episodes. Half of the single view episodes have visits in them.

The special circumstances of single view and special view X-rays are supported by the percent of episodes with more than one interpretation, also on Table 5-5, and the percent of episodes with brief or minimal visits. Nearly 9 percent of the single view episodes and 11 percent of the special view episodes have more than one interpretation, compared to only 3 percent of the 2 to 3 view episodes. Among episodes with visits, very few have brief or minimal visits.

The level of intensity of the office visits identified in the chest X-ray episodes is of critical interest. The distinction between visits coded as either brief or minimal and other higher intensity visits is important because, according to the CPT manual, the latter include the evaluation of diagnostic tests and procedures while the former do not. Of all office visits delivered in conjunction with chest X-rays, only 6.4 percent were coded as either brief or minimal. The fact that chest X-ray interpretations are being billed in addition to these high intensity (and higher cost) office visits has important implications from a budgetary standpoint and is the central issue being explored in this project.

Table 5-5

Type of Chest X-Ray: Distribution of Office-Based Episodes by Percent with Visit, Intensity of Visit, and Multiple Interpretations

	Type of Chest X-Ray				
	Single View	2 to 3 Views	4 or more Views	Special View	Combination
Percent distribution of episodes	22.8	75.6	0.5	0.1	0.9
Percent of episodes with visit	49.8	70.2	61.3	21.8	29.4
Percent of episodes with brief or minimal visit (for episodes with visit)	3.8	4.5	4.5	0.9	1.9
Percent of episodes with more than one interpretation	8.6	2.9	2.9	10.6	98.5

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

5.2.3 Distribution of Interpretations and Visits by Episode

As shown in Table 5-6, the vast majority of episodes -- 95 percent -- include billing for only one chest X-ray interpretation.[4] Although the multiple interpretation episodes represent a small fraction of the overall total number of episodes (5.1 percent), there are several differences between the multiple and single interpretation episodes that are noteworthy.

Table 5-6 presents the average charge per episode for episodes with one, two, and three or more interpretations. The average charge per episode is made up of two components, charges for chest X-rays and charges for visits. The charge per chest X-ray or visit appears to be lower when more than one interpretation is provided, since the average charges are less than double that for one interpretation. Part of the reason for the low rate of increase in charges is that the multiple interpretation episodes usually do not have visits, thus the average primarily reflects interpretation charges.

A dramatic decline in the likelihood of having a visit in the episode is seen as the number of interpretations increases. Whereas two-thirds of the single interpretation episodes have at least one visit, only 10 percent of the episodes with 3 or more interpretations have at least one visit. This may be related to difficult cases being referred to radiologists, who do not provide visits, combined with the referring visit being excluded from the episode.

The number of physicians per episode also varied with the number of interpretations per episode, though less dramatically

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[4] Interpretation refers to billing for either a separate interpretation or a global claim (interpretation plus technical).

Table 5-6

Selected Variables by the Number of Interpretations per Office-Based Chest X-Ray Episode

Selected Variables	Number of Interpretations per Episode		
	1	2	3 or more
Number of Episodes	308,316	12,093	1,872
(percent distribution)	94.9%	3.7%	1.4%
Average Charge per Episode	$57	$62	$75
Number of Visits per Episode (percent distribution)			
0	33.5%	51.5%	90.1%
1	62.7	38.2%	8.1
2 or more	3.9	10.3	1.8
Number of Physicians per Episode (percent distribution)			
1	82.3%	62.3%	87.3%
2	16.7	33.5	10.9
3 or more	1.0	4.2	1.8

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

than the number of visits. In the majority of episodes, there is only one physician billing. Episodes with more than one physician appear most frequently in the two interpretation category; this may indicate a situation in which a primary physician administers and interprets an X-ray and, subsequently, a specialist offers a second interpretation.

5.2.4 Variation in Billing Patterns by Specialty

In order to explore differences in the use of chest X-rays by those specialties frequently billing for them, each episode was linked to the specialty or specialties of the physician(s) billing for services within the episode.[5] While almost all specialties bill at least occasionally for chest X-ray services, several specialties clearly predominate. As expected, radiologists, internists, general or family practitioners, and cardiologists have the most billings for chest X-ray-related services in the office setting. Radiologists are the most frequently represented specialty, with charges in 34 percent of the episodes (see Table 5-7). Internists have charges in 27 percent of the episodes, and family or general practitioners have charges in 16 percent of the episodes. Cardiologists have charges in only 5 percent of the episodes, as they see a limited diagnostic group of patients. No other single specialty has billings for chest X-ray-related services in more than three percent of episodes.

Almost none of the episodes with radiologists include a visit. This is in stark contrast to the other specialties providing chest X-rays, in which visits are provided within the episode approximately 90 percent of the time. On the other hand, multiple interpretations of an X-ray within an episode are a rare

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[5] Physicians were linked to an episode for any claim submitted, either chest X-ray (any procedural component) or a related visit.

Table 5-7

Average Allowed Charges Per Office-Based Chest X-Ray Episode and Percent of Episodes with Visit, by Specialty _a

Specialty	Allowed Charges	Percent of Each Specialty's Episodes with Visit	Percent of Each Specialty's Episodes with More Than One Interpretation	Percent of Total Episodes with Bill in Specialty
Radiology	$28	0.6%	6.9%	34.2%
Cardiology	$70	92.4%	0.9%	4.7%
Family or General Practice	$53	90.2%	1.2%	16.1%
Internal Medicine	$65	91.5%	0.9%	26.7%

Note:

_a Episodes are attributed to specialties of physicians billing for chest X-rays (any procedural component) or related visits in the episodes. Episodes in which more than one specialty submitted claims were counted once for each specialty represented. No single specialty, other than those listed here, accounted for more than three percent of claims.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

event (about 1 percent) for all but the radiologists. Radiologists have more than one interpretation in 7 percent of episodes.

Cardiologists have the highest average allowed charges per episode ($70). Internists have allowed charges averaging $65 per episode, and family or general practitioners have average allowed charges of $53 per episode. Charges for radiologists are a strikingly smaller $28 per episode; this is because these episodes rarely include visits.

The differences in allowed charges among specialties is due primarily to differences in charges for office visits rather than charges for the X-ray services. The average charges for chest X-ray services vary little by specialty, from $34 for general and family practitioners and radiologists to $36 and $37 for internists and cardiologists, respectively (Project HOPE, 1990). The range of charges is somewhat larger for visits. Average charges for office visits were $21 for both family and general practitioners in 1988 compared to $28 for internists and $32 for cardiologists. There is likely to be a clinical difference in the severity of illness and complexity of cases for patients seen by the cardiologists and the general and family practitioners making the cardiology visit more intense.

5.2.5 Variation in Billing Patterns by Carrier and Region

Since individual carriers employ practices which may influence observed billing patterns, it is important to investigate differences among carriers. The proportion of episodes for which a visit was billed varied dramatically by carrier, from a low of 9 percent of a carrier's episodes containing a visit to a high of 82 percent. In other words, for one carrier, only 9 percent of its episodes contained a visit

while, at the other extreme, 82 percent of another carrier's episodes contained at least one visit. While the range is large, the episodes of most carriers include visits; half of the carriers have more than two-thirds of their episodes with visits (data not shown). It is not clear whether these differences reflect geographic practice patterns or carrier practices.

In order to examine whether billing patterns vary by locality, the chest X-ray episodes were grouped by U.S. Census region.[6] Selected information about chest X-ray episodes by geographic region is presented in Table 5-8. The distribution of episodes roughly follows the distribution of the elderly population though the South accounts for somewhat more chest X-ray services (41 percent of episodes compared to 35 percent of Medicare beneficiaries). The South accounts for approximately 40 percent of the episodes, and the Northeast, North Central region, and the West each accounts for approximately 20 percent of the episodes. Average allowed charges per episode vary quite a bit, ranging from $50 in the North Central region to $70 in the West. The North Central region has the highest percentage of episodes (6.4 percent) with more than one interpretation, and the West has the lowest percentage (5.8 percent). The percent of episodes with a visit is close to the national average of 65 percent for all but the Northeast, in which it is 55 percent.

5.3 Implications for Bundling

The descriptive statistics presented in the preceding section provide information helpful in examining the feasibility

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[6] Episodes were first mapped to one or more carriers and then from carrier to region. Episodes can thus be assigned to more than one region. In addition, episodes involving Railroad Retirement Program beneficiaries do not map to any region and were excluded from the total.

Table 5-8

Average Allowed Charges per Office-Based Chest X-Ray Episode and Percent of Episodes with Visit by Region

	Percent of Episodes	Average Allowed Charges per Episode	Percent of Episodes with a Visit	Percent of Episodes with More than One Interpretation
All Regions _a	324,810	$58	65.1	5.1
Northeast	19.4	$58	55.4	4.5
North Central	21.6	$50	64.0	6.4
South	40.6	$56	68.6	5.1
West	18.4	$70	68.8	3.8

Note:

_a Some episodes map to more than one carrier and may be linked to more than one region. In addition, episodes involving Railroad Retirement Program beneficiaries do not map to any region and were excluded from the total.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

of various bundling strategies. Some of the key pieces of information presented in that section are as follows:

- 79 percent of office-based chest X-ray episodes had at least one global bill;
- 65 percent of episodes had at least one visit;
- 95 percent of episodes had one interpretation only;
- 18.3 percent of episodes involved more than one physician;
- only 6 percent of visits billed in conjunction with a chest X-ray were coded as brief or minimal.

While the episodes can be characterized in a number of ways and a variety of different types of episodes can be observed, the prototypical episode pertinent to bundling can be summarized as follows: this episode contains both an interpretation bill and a visit bill by one physician on one day. Episodes with at least one interpretation and one visit billed by the same physician account for half of all episodes and three-quarters of all episodes with visits (Table 5-9). This type of episode will be the central focus of the bundling analysis.

5.3.1 Bundling Strategies

The simplest bundling strategy is a combined reimbursement for a medical visit and the interpretation component of a chest X-ray ordered or performed as part of that visit. While this type of packaging will be the main focus of our analysis, a number of other potential methods of combining services for the purposes of reimbursement will be discussed briefly below. Issues related to bundling services across time (e.g., visit one day, interpretation the next), across physicians (e.g., visit by one physician, referral to another physician for interpretation), to include more than one interpretation by the same physician,

Table 5-9

Office-Based Chest X-Ray Episodes: Interpretation and Visit Billed by the Same Physician

Type of Episode		Number of Episodes	Percent of Episodes _a		
Number of Interpretations	Number of Visits		Case 1 _b	Case 2 _c	Case 3 _d
1	1	193,187	76.6%	76.6%	71.5%
1	2 +	11,894	68.4	25.5	52.4
2 +	1	4,975	75.0	27.2	67.9
2 +	2 +	1,316	84.2	57.9	72.9
TOTAL		211,372	76.2	72.5	70.3

NOTES:

_a Same physician defined as instances where both the specialty and provider ID are the same.

_b Case 1 are episodes where same physician bills for AT LEAST one interpretation and one visit.

_c Case 2 are episodes where the same physician bills for ALL interpretations and visits.

_d Case 3 are episodes where the same physician billed for AT LEAST one interpretation and one visit; AT LEAST one interpretation and one visit were billed on the same day; and there were NO brief or minimal visits billed in the episode.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

and to include the technical component will be reviewed and discussed in the context of the data presented.

Of the 324,761 episodes constructed for this analysis, 35 percent included no visit at all and, therefore, have no potential for bundling interpretation and visit. The remaining 65 percent of episodes, all of which include at least one visit, are characterized in Table 5-9 by whether or not the same physician billed for both the interpretation(s) and the visit(s). Across all of the episodes listed, the same physician billed for at least one interpretation and one visit in 77 percent of cases. One physician billed for all services in a majority of episodes overall but, in the cases of one interpretation and two visits and two interpretations and one visit, only one fourth of the episodes had bills from only one physician.

For episodes with at least one visit, 70 percent can be represented by the prototypical episode described above consisting of one chest X-ray interpretation, and one visit billed by one physician on one day.[7] These cases require only the most straightforward of possible ways of bundling chest X-ray services and medical visits. In these cases, reimbursement for interpretation of a chest X-ray would be disallowed if provided along with a same-day visit by one physician. Charges for interpretation would be defined as either a claim for the interpretive component only or some portion of the global charge. Given the size of current payments for interpretation relative to office visit fees, denial of these claims would reduce the typical reimbursement by 23 percent.[8]

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[7] This number also excludes all episodes in which at least one visit was brief or minimal.

[8] This assumes a global charge of $35 ($16 for interpretation) and a visit charge of $36 for total reimbursement of $71 before bundling and $55 afterwards.

As noted by Bogen et al. (1989), this sort of change in reimbursement practices would, in all likelihood, induce changes in physicians' billing practices. There are two likely reactions on the part of physicians to attempt to maintain their revenues. The first is to increase the visit intensity level billed (e.g., upcode from an intermediate to an extended visit) to compensate for the decrease in receipt of fees for interpretation. Another possibility is for the physician to bill for a brief visit in conjunction with the interpretation.

Assuming that the average reimbursement for interpretation is $16, coding a visit to the next higher intensity level could recapture between 38 and 163 percent of the disallowed interpretation fee depending upon the initial visit level.[9] Since only 11 percent of visits in the analysis are coded as extended, the 163 percent figure which is achieved by upcoding from extended to comprehensive, would be relatively infrequent.

The range of potential reimbursement amounts for the average physician with and without bundling, are presented in Table 5-10. Clearly, a physician could recoup a larger proportion of the lost interpretation fee by upcoding the visit by more than one level. However, for the 24 percent of visits which are currently coded as comprehensive no increase in intensity is possible. For limited visits, on the other hand, downcoding might be more advantageous. While the visit fee would fall from $22 to $17, the physician could continue to bill for the interpretation.

Two additional possibilities would be for the physician to bill for the interpretation of the chest X-ray on the day

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[9] Average allowed charges for a limited visit were $22, for an intermediate visit $28, for an extended visit $39, and $65 for a comprehensive visit. To compute the percent recaptured through upcoding, simply divide the difference between two visit fees (the amount gained) by the $16 interpretation charge (the amount lost).

Table 5-10

Average Allowed Charges for Office-Based Chest X-Ray Episodes:
Pre-Bundling and Post-Bundling

Type of Visit	Percent Distribution of Visits	Allowed Charge (Visit Only)	Total Reimbursement for Visit and Global Chest X-Ray Pre-Bundling_a	Total Reimbursement for Visit and Global Chest X-Ray Post-Bundling_b
Brief or minimal	6.4%	$17	$52	$52
Limited	27.3	22	57	41
Intermediate	31.2	28	63	47
Extended	10.6	39	74	58
Comprehensive	24.4	65	100	84

Note:
_a Assumes $35 reimbursement for global claim, $16 for interpretation and $19 for technical component.
_b Assumes interpretation fee is disallowed when Chest X-Ray is provided along with other than brief/minimal office visit.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

following the office visit or for the physician to administer and bill for more than one chest X-ray. To legitimize the former practice, the physician could call the patient with results or formally note the interpretation in the medical record on the next day. It is also possible that primary care physicians (family or general practitioners and internists) would simply refer their patients to specialists for X-rays since the added work of interpreting test results might outweigh the increase in reimbursement allowed.

There is no evidence to indicate how widespread any of these reactions on the part of physicians might be. In terms of altering the level of visit billed, it is also not clear how to prevent such behavior. Stricter accounting of the content of visits could be required, but such a system would be administratively burdensome. Increases in the practice of billing on different days or for more than one chest X-ray, on the other hand, could be ameliorated by the bundling strategies discussed below.

While the method of bundling payment for chest X-ray interpretation described above is the simplest method, there are a number of other variants possible. Many of these have been discussed in Mitchell et al. (1987) and Miller and Sulvetta (1990) although those papers had a much broader focus and included a variety of different types of services. Specifically, in terms of chest X-ray services, the four possibilities mentioned above are as follows:

- bundling across time;
- bundling multiple professional components;
- bundling across physicians;
- bundling the technical component.

The strategy of bundling across time has been proposed with respect to a number of different procedures. Surgical procedures seem particularly suitable, with one payment for pre-surgical evaluation, the surgery itself, and post-operative follow-up. The proposed time periods have been quite extensive. Bundling across time for chest X-ray services would have a much narrower focus as any related services would be provided within a period of a few days.

While the data presented in Section 5.2 make clear that the majority of related services are provided on the same day, bundling across time is worth considering for two reasons.[10] First, while it may represent a relatively small proportion of cases, expanding the timeframe within which to package services would be relatively straightforward to accomplish. Moreover, if reimbursement rules focused only on same-day interpretation and visits, it would be quite simple for physicians to maintain their reimbursement by altering their billing or practice patterns to bill over more than one day. Thus, bundling across time could be a deterrent to potential gaming of the system. While it doesn't account for a large proportion of cases overall, we have included episodes which span more than one day in the savings estimates presented in the next section.[11]

Another possibility for packaging of services includes those situations in which a single physician bills for more than one chest X-ray interpretation. These may be situations in which the first interpretation is for a screening X-ray, which indicates the need for a second X-ray and interpretation. It would seem feasible to include all professional services required in the

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[10] Of all episodes in which the same physician bills for at least one interpretation and one visit, only 1.3 percent take place on more than one day.

[11] Episodes which include more than one day are counted in the upper bound estimate only.

delivery of the chest X-ray within the package of services. Thus, bundling services to include more than one interpretation by the same physician has also been included in the estimates; these episodes account for 3.5 percent of those with some bundling potential.[12]

Bundling services across physicians is somewhat more complex. Theoretically, one might want to consider bundling in the cases where a patient was given a chest X-ray by one physician (who billed for a visit) and, then, referred to a specialist for the (or a second) interpretation. By making the payment to the primary physician only, this sort of bundling would ensure that the financial risk of excessive consultations would be borne by the primary physician; the decision maker would then bear the costs of ordering additional services. In contrast to EKG services where this type of referral pattern was uncommon, over one-quarter of chest X-ray episodes with visits involve more than one physician. The vast majority of episodes with more than one physician are situations in which the same physician does not bill for both a visit and an interpretation. While bundling payment for more than one physician may produce sizeable savings to Medicare, such a strategy is considerably different in its implications than the basic approach taken in this report; thus, we have not included such a strategy in our savings estimates.[13]

The possibility of including the entire chest X-ray service (both the professional and technical components) in the

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[12] Bundling multiple professional components with a single visit may demand consideration of packaging multiple professional components billed without a visit. This has not been explored in the current analysis.

[13] The interpretation charges (equivalent to potential savings from bundling) in these episodes where different physicians bill for the visit and the interpretation amount to approximately $860,000 or a third again as much as the total savings described in the next section.

reimbursement package is conceptually appealing. Since the vast majority of chest X-ray services are billed globally, physicians are already accustomed to receiving one payment for delivery and interpretation. The problem, however, arises in terms of the size of the payment. On average, the current reimbursement for a global chest X-ray is almost equal to that for an office visit. Thus, inclusion of both components in the visit fee would reduce reimbursement by 47 percent on average, quite a significant drop. The determination of whether such a reduction is justifiable hinges on a number of factors; the critical issue would seem to be the cost involved in delivering the service -- the cost of purchasing, maintaining, and operating a chest X-ray machine.[14] Of course, visit fees could be adjusted to account for a variety of diagnostic tests and procedures; this could add considerably to the reimbursement system's complexity and might not result in appreciable cost savings.

5.3.2 Estimates of Savings from Bundling

Estimates of the savings which would be realized through bundling of chest X-ray interpretation and medical office visits are presented in Table 5-11. The basic premise is that physicians would not be reimbursed for the interpretation component of chest X-rays when delivered in conjunction with an office visit. Two different estimates were calculated, a lower and an upper bound. This was necessitated by the complexity of linking visits and chest X-rays within the episodes. The following types of episodes were excluded as sources of savings from bundling for the upper bound estimate:

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[14] We are assuming that, since most chest X-rays are billed globally, the majority of physicians own and operate their own equipment.

Table 5-11

Estimate of Savings from Bundling Reimbursement of Chest X-Ray Interpretation with Office Visit Fee, by Specialty and Region

	Lower bound estimate_a	Upper bound estimate_b
Savings		
All Medicare beneficiaries_c	$51,718,062	$53,651,220
5% sample	$2,585,903	$2,682,561
Region		
Northeast	$484,028	$492,479
North Central	$485,228	$511,854
South	$1,117,987	$1,160,773
West	$498,597	$517,392
Specialty		
General/Family Practice	$667,167	$692,377
Radiology	$16,187	$32,178
Cardiology	$208,688	$212,691
Internal Medicine	$1,156,060	$1,182,726
Other	$537,802	$562,589

Notes:

_a The savings indicated by the lower bound are estimated by adding the average allowed chest X-ray interpretation charges and 46 percent of the chest X-ray global allowed charges for episodes where the same physician performs all of the interpretations and visits in the episode or charges for one interpretation where more than one physician is involved, for which the visit intensity is more than brief and at least one visit and interpretation are on the same day.

_b The savings indicated by the upper bound are estimated by adding the average allowed chest X-ray interpretation charge and 46 percent of the chest X-ray global allowed charges for episodes where the same physician performs at least one interpretation and one visit.

_c Estimate for the 5% beneficiary sample multiplied by a factor of 20.

Source: Project HOPE estimates based on the 1988 EMAD 5% Beneficiary File.

(1) Episodes with no visit;

(2) Episodes with only one visit where the visit was coded as brief or minimal;

(3) Episodes where the same physician did not bill for at least one interpretation.

All remaining episodes were included in the savings calculations. The upper bound estimate may overstate potential savings by including some situations in which a second chest X-ray interpretation counted as part of savings was, in fact, billed by another physician who would be entitled to reimbursement. Some of the estimated savings may also be from interpretations linked to brief or minimal visits where there was more than one visit in an episode; these should also be reimbursed and not counted as part of savings.

The lower bound estimate, on the other hand, may understate potential savings. It includes only episodes in which all visits were billed at a limited level or higher, so that some episodes including more than one type of visit may have been incorrectly excluded. The lower bound estimate excludes all episodes that involve more than one day even if the same physician bills for the two services on adjacent days. The lower bound estimate also counts as savings only one interpretation from an episode if more than one physician has billed. For the episodes included in each of the lower and upper bound estimates, the savings estimates are equal to 46 percent of all global fees plus 100 percent of all interpretation fees.[15]

The savings from disallowing fees for interpretation of a chest X-ray is estimated to be between $2.6 and $2.7 million for

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[15] The percentage of global charges that are accounted for by interpretation is assumed to be 46 percent. This estimate is derived from the ratio of total allowed charges to total services presented in Table 3-1.

the 5 percent BMAD sample or from $52 to $54 million for the entire Medicare beneficiary population (see Table 5-11). Taken as a proportion of all Medicare outlays on chest X-rays and related visits delivered in a physician's office, this represents between a 13.8 and 14.3 percent reduction in reimbursement for these services. These estimates do not account for any change in physician billing practices in response to the implementation of bundling.

5.3.3 Impact by Specialty and Region

Estimated savings by region are distributed similarly to the number of episodes by region as reported in Table 5-8. Just under 20 percent of savings would come from each of the Northeast, North Central region, and West, with slightly over 40 percent attributable to the South. In terms of all chest X-ray services and related visits provided in each region, the reduction in reimbursement from packaging interpretation and visits is presented in Table 5-12. The expected reduction in revenues is somewhat higher in the South than the nationwide average (15.7 compared to 14.3 percent for the upper bound estimates) and slightly lower in the Northeast and in the West (13.4 and 12.4 percent, respectively).

The distribution of savings by specialty is markedly different than the distribution of episodes across specialties; this difference is due to the almost negligible effect that bundling would have on the reimbursement of radiologists. As shown in Table 5-11, the predicted savings from bundling reimbursement of chest X-ray interpretation with office visit fees attributable to radiologists is only $32,000 or 1.2 percent of their total Medicare fees for chest X-ray services and related office visits. The small savings from this group is due to the fact (as noted in Table 5-7) that less than one percent of chest X-ray episodes linked to radiologists include an office visit.

Table 5-12

Effect of Bundling Chest X-Ray Interpretation with Office Visit Fee on Reimbursement Levels by Region and Specialty

	Lower bound estimate	Upper bound estimate
Percent reduction in reimbursement_a		
Total	13.8%	14.3%
Region		
Northeast	13.1%	13.4%
North Central	13.9%	14.7%
South	15.1%	15.7%
West	12.0%	12.4%
Specialty		
General/Family Practice	20.3%	21.1%
Radiology	0.4%	0.9%
Cardiology	16.5%	16.8%
Internal Medicine	17.1%	17.5%
Other	14.3%	14.9%

Note:

_a The percent reduction in reimbursement is calculated by taking the savings noted for each category (overall, region, and specialty) in Table 5-11 and dividing these totals by the overall charges for all episodes in these categories.

Source: Project HOPE estimates based on the 1988 BMAD 5% Beneficiary File.

Almost half of the estimated savings in Medicare revenues would come from internists; another one-quarter of the total savings are accounted for by general or family practitioners. General and family practitioners would face the highest percentage reduction in reimbursement for chest X-ray-related services -- 21.1 percent for the upper bound estimate.

The impact of bundling services on various specialties should be viewed with some caution. First, these percentage reductions in reimbursement apply only to office-based chest X-ray-related services and, thus, may represent only a small proportion of a physician's overall income. Second, the figures discussed represent an average change for the entire specialty; however, individual members of each specialty have a variety of billing patterns and there will be winners and losers within each group.[16]

Furthermore, individual physicians may "win" on some patients and "lose" on others. In order to provide more detailed estimates of the impact across and within specialties, it would be necessary to examine all of the claims submitted by a given set of physicians rather than all of the claims of a given set of beneficiaries. Without such an analysis, it is not clear what proportion of a physician's practice consists of chest X-ray-related services delivered in the office setting and, therefore, what impact the implementation of the bundling policy discussed here would have on total physician revenues for a given physician.

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[16]See, for example, Levy et al. (1990) for a discussion of the impact of the Resource Based Relative Value Scale by specialty and geographic area.

6. ANALYSIS OF BILLING FOR CHEST X-RAYS IN AN INPATIENT SETTING

6.1 Introduction

The purpose of this section of the report is to describe the analysis of billing patterns for chest X-rays that are performed in an inpatient hospital setting. As with the examination of office-based chest X-rays, the underlying aim is to determine the desirability and feasibility of bundling reimbursement for the interpretation of a chest X-ray and a medical visit when these two services are provided jointly.

Given the frequency of visits received by a hospital inpatient together with the potential for multiple physicians providing care in this setting, the issue of bundling reimbursement for services is quite complex. Not only will there be a number of different arrangements under which the services are provided, but the way in which each situation is represented by available data may differ. For example, a patient receiving a chest X-ray may have the following billing records: (i) a bill for a physician visit only; (ii) a bill for a physician visit and a bill for the professional component of a chest X-ray, both from the same physician; (iii) a bill for a physician visit and a bill for the professional component of a chest X-ray, each from different physicians.[21]

In addition, there might be interpretations billed by more than one physician. Moreover, visits unrelated to the chest X-ray could be billed on the same day, or interpretations and related visits could be billed on different days. In fact, a

[21] There should be no global or technical component claims in the hospital setting, since the technical component is part of a hospital's overhead and is covered in the Medicare Part A payment to hospitals. We did, however, find a small proportion of these claims.

major finding is that chest X-ray interpretations are accompanied by medical visits in an inpatient setting in only 1.4 percent of episodes; the implications for policy are discussed in later sections of the report.

As with chest X-rays billed in a physician's office, examination of billing patterns is further complicated by variations in carrier practices. The use of modifiers, as discussed in Section 2.2, varies across carriers, and, thus, observed differences in billing by procedural component may be artificial. In addition, individual carriers may have rules governing some of the specific situations described above.

The following section provides a variety of descriptive statistics to aid in understanding physician billing patterns for chest X-rays and related inpatient visits. The initial section (6.2.1) provides general information on the size of these billings, the services which make up an episode and a hospital stay, and the services received by an average beneficiary. Section 6.2.2 is a more in-depth look at the episodes we have constructed, with detailed information on the number of chest X-ray-related services by diagnostic category, the number of visits, the number of physicians, and the charges for each type of service delivered. The final two sections examine variation in episode characteristics and billing patterns by physician specialty and U.S. Census region. All of this descriptive information was used in establishing the approach to bundling of services described in Section 6.3 of the report.

6.2 Findings

6.2.1 Allowed Charges and Number of Services

Total allowed charges for all chest X-rays delivered in an inpatient setting and related inpatient physician visits were

$10.2 million for the 1988 5 percent BMAD sample. When adjusted by a factor of 20 to represent the entire Medicare beneficiary population, total allowed charges for these services were approximately $203 million. As shown in Table 6-1, charges for visits were quite small, accounting for approximately 10 percent of the total. In terms of the total number of services delivered, however, only 4 percent were for physician visits. Thus, the ratio of charges to services shown for visits is almost three times that for the chest X-ray services provided ($38 vs. $13).

The distribution of charges and services by chest X-ray procedural component shows that 90 percent of all inpatient chest X-ray charges and 96 percent of services are for the professional (interpretation) component only. The technical component of a chest X-ray delivered to a patient in a hospital should be included in the Medicare Part A payment to the hospital; thus, the 3.9 percent of bills that we report here as either global claims or for the technical component only are something of an anomaly. One possibility is that they are due to carrier practices with regard to use of modifiers (e.g., a claim for interpretation only is submitted without the appropriate modifier).

Average allowed charges and average number of services are presented in Tables 6-2 through 6-4 at the beneficiary, admission, and episode levels. As shown in Table 6-2, beneficiaries with at least one chest X-ray in an inpatient setting received an average of 3.3 chest X-rays; those with at least one visit (in conjunction with a chest X-ray) received an average of 5 related visits annually. The average allowed charges per beneficiary were $189 for visits and $43 for the chest X-ray interpretations.

Table 6-1
Total Allowed Charges and Number of Services for Chest X-Rays
Billed in an Inpatient Setting

	All Services	Chest X-Ray				Visits
		All	Global	Interpretation	Technical	
Total Allowed Charges	$10,163,634	$9,177,838	$2,292,296	$6,882,102	$2,810	$985,796
Percentage of All Charges	100%	90.3%	-	-	-	9.7%
Percentage of Chest X-ray	-	100%	25.0%	75.0%	0.0%	-
Total Services	712,250	686,367	168,669	517,571	127	25,883
Percentage of All Services	100%	96.4%	-	-	-	3.6%
Percentage of Chest X-ray	-	100%	24.6%	75.4%	0.0%	-
Ratio of Charges to Services (Average Charge per Service)	$14	$13	$14_a	$13	$22*	$38

_a Since charges for the technical component are part of the DRG payment, these claims may be inappropriately modified.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

Table 6-2
Average Allowed Charges and Average Number of Services
for Beneficiaries Receiving a Given Procedural Component or Visit:
Inpatient Chest X-Ray Episodes

	All Services	Chest X-Ray				Visits
		All	Global	Interpretation	Technical	
Average Allowed Charges per Beneficiary_a	$48.48	$43.78	$40.11	$42.66	$22.48	$188.74
Average Services per Beneficiary_b	3.4	3.3	3.0	3.2	1.0	5.0

Notes:

_a Average allowed charges per beneficiary are the total allowed charges for a given procedural component or visit (e.g., total global allowed charges) divided by the total number of beneficiaries having that type of charge.

_b Average allowed services per beneficiary are the total services for a given procedural component or visit (e.g., total global services) divided by the total number of beneficiaries having that type of service.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

The admission-level information presented in Table 6-3 indicates that 2.3 chest X-rays were administered, on average, per admission. The lower number of chest X-ray interpretations per admission compared to the beneficiary level shows that a substantial percentage of beneficiaries had multiple admissions.

A total of 498,628 inpatient chest X-ray episodes were created, with an average of 2.4 episodes per beneficiary with an inpatient chest X-ray-related service. The charges and number of services for these episodes is presented in Table 6-4. Averages presented in Table 6-4 are for episodes with a given procedural component only; for example, the $143 average allowed charge for visits covers the 3.7 visits delivered in an average episode with visits. Average allowed charges for all services included as part of the episode were $20; the average number of services per episode was 1.4.

6.2.2 An Overview of the Episodes

The majority of the remaining analysis is performed at the episode level, in order to make the connection between chest X-rays and related visits required for the analysis of bundling. While the construction of episodes is described in detail in Section 2.4, one difference between the formation of the office episodes and inpatient episodes should be reiterated. Due to the large number of visits received in an inpatient setting, inpatient visits were required to have the same physician and specialty identifiers as the chest X-ray anchor record to be included in the episode. Thus, the inpatient episodes are somewhat less likely than office-based episodes to include a chest X-ray and visit performed by different physicians.

Table 6-5 presents additional information about the frequency of services and average allowed charges for chest X-ray

Table 6-3
Average Allowed Charges and Average Number of Services
per Admission with a Given Procedural Component or Visit
Inpatient Chest X-Ray Episodes

	All Services	Chest X-Ray				Visits
		All	Global	Interpretation	Technical	
Average Allowed Charges per Admission_a	$34.46	$31.12	$29.83	$30.71	$22.48	$166.63
Average Number of Services per Admission_b	2.4	2.3	2.2	2.3	1.0	4.4

Notes:

_a Average allowed charges per admission are the total allowed charges for a given procedural component or visit (e.g., total global allowed charges) divided by the total number of admissions with that type of charge.

_b Average allowed services per admission are the total services for a given procedural component or visit (e.g., total global services) divided by the total number of admissions with that type of service.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

Table 6-4
Average Allowed Charges and Average Number of Services
per Inpatient Chest X-Ray Episode with a Given Procedural Component or Visit

		Chest X-Ray				
	Services	All	Global	Interpretation	Technical	Visits
Average Allowed Charges per Episode_a	$20.38	$18.41	$18.35	$18.26	$22.31	$142.56
Average Number of Services per Episode_b	1.4	1.4	1.4	1.4	1.0	3.7

Notes:

_a Average allowed charges per episode are the total allowed charges for a given procedural component or visit (e.g., total global allowed charges) divided by the total number of episodes having that type of charge.

_b Average allowed services per episode are the total services for a given procedural component or visit (e.g., total global services) divided by the total number of episodes having that type of service.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

Table 6-5

Chest X-Ray Inpatient Episodes: Diagnoses, Charges, and Services_a

Diagnosis-Related Group	Percent Distribution of Episodes	Average Allowed Charges	Number of Interpretations	Number of Visits
All	498,628	$20	1.4	.05
Cardio-pulmonary/surgical	12.3	$28	2.0	.05
Gastro-intestinal/surgical	3.9	$23	1.7	.03
Orthopedic/surgical	3.2	$16	1.2	.02
Other surgical	12.4	$19	1.3	.03
Nervous system circulatory/medical	4.2	$18	1.2	.04
Respiratory assessment/medical	17.0	$20	1.3	.07
Circulatory assessment/medical	21.0	$20	1.3	.06
Gastro-intestinal/medical	3.9	$18	1.2	.05
Systemic infections/medical	1.6	$19	1.3	.05
Other medical	16.9	$18	1.2	.06
Other	3.7	$21	1.4	.05

_a Averages presented in this table may differ from those in Table 6-4. These averages are taken in the diagnostic category rather than only those episodes involving the specific service.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

episodes as well as the diagnosis-related group (DRG) for the admission. While the averages in Table 6-4 include only those episodes with the particular chest X-ray component or visit, the information presented in Table 6-5 accounts for all of the episodes, regardless of whether a particular service is provided. When taking into account all of the episodes, the number of visits is fairly infrequent -- there are a total of 26,000 X-ray-related visits or one visit for every 20 episodes (26,000/498,628=0.5). Overall, there are 1.4 chest X-ray interpretations billed per episode.

Episodes are also classified according to DRG categories in Table 6-5. The majority of chest X-ray episodes (65 percent) are part of a medical (rather than surgical) hospital stay; approximately 32 percent are part of a surgical admission. Over one-third of episodes are from medical respiratory assessment or medical circulatory assessment DRG's.

Average allowed charges per episode vary somewhat by DRG category. Episodes with a cardio-pulmonary, surgical DRG have allowed charges that are $8, or 40 percent, higher than the average for all DRG episodes ($28 compared to $20). The average allowed charge for episodes not involving cardio-pulmonary surgical DRGs are closer to the $20 average. Both cardio-pulmonary surgical and gastro-intestinal surgical DRGs have a greater number of chest X-ray interpretations per episode than average.

Sixteen percent of inpatient episodes included more than one chest X-ray interpretation (see Table 6-6). While a radiologist is not always present when an X-ray needs to be read, many (if not all) hospitals require all X-rays to be read by a staff radiologist for quality control purposes. Given that an attending physician (non-radiologist) is often likely to read a chest X-ray in order to expedite treatment for a critically ill

Table 6-6: Number of Interpretations per Inpatient Chest X-Ray Episode

	Number of Interpretations		
	1	2	3+
Number of Episodes	420,472	42,792	34,158
(percent distribution)	84.3%	8.6%	6.9%
Average Charge per Episode	$15	$30	$70
Number of Visits per Episode			
0	98.7%	97.8%	98.4%
1	0.4	0.7	0.5
2+	0.9	1.6	1.2
Number of Physicians per Episode			
1	100.0%	93.1%	93.7%
2	0.0	6.8	5.3
3+	0.0	0.0	0.9

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

patient, one might expect to find a large number of episodes with two interpretation claims.

For purposes of this analysis, there can be more than one chest X-ray within an episode if the chest X-rays were on the same or adjacent days, as described in Section 2.4. This is higher than the 5 percent of office-based episodes which included more than one chest X-ray interpretation (see Section 5.2.3). This was expected, because sick, hospitalized patients may require multiple chest X-rays per day. However, it is considerably lower than the 30 percent of inpatient episodes with multiple EKG interpretations (see Section 4).

As shown in Table 6-6, average charges per episode -- both for chest X-ray services and for physician visits -- rise with the number of interpretations per episode. This is due to the higher number of services obtained in these types of episodes. In fact, the average charge per visit within an episode varies little so that it appears that the level of visit billed does not change with the number of interpretations per episode.

The number of visits per episode and the number of physicians involved in an episode vary little according to whether the episode includes one, two, or three or more interpretations. The proportion of episodes with multiple visits is quite low overall and fairly constant as the number of interpretations billed increases. While the probability of having more than one physician involved in an episode increases somewhat with the number of interpretations, it is interesting to note that, even for episodes with three or more interpretations, 94 percent involve a single physician.

The impact of the type of care unit (intensive or critical care unit vs. medical or surgical) on the charges and services per chest X-ray episode is presented in Table 6-7. While

Table 6-7 Chest X-Ray Charges and Services for Inpatient Episodes With Intensive Care and Non-Intensive Care Use_a

Type of Stay	Total Number of Episodes	Average Number of Visits_b	Average Episode Charge_c	Percent of Episodes with 1+ Visits
With Intensive Care Days	205,186	0.04	$23	1.1%
With No Intensive Care Days	293,442	0.06	$18	1.6%

_a Intensive care means the patient was admitted to an intensive care unit during the hospitalization. Non-intensive care means the patient stayed on a regular ward.

_b Average number of visits are total number of visits divided by the total number of episodes.

_c Average episode charge is for all episodes, with and without visits.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

differences are quite small, visits are slightly more common in episodes with no intensive care days. The average total episode charge, however, was 28 percent higher for episodes with intensive care stays, than for those without.

6.2.3 Variations in Billing Patterns by Specialty

As was done for the office-based episodes, inpatient chest X-ray episodes were linked to the specialties of all physicians billing for a chest X-ray or a visit within the episode. The distribution of episodes by physician specialty is shown in Table 6-8. Nearly 90 percent of episodes involved radiologists. Less than two percent included a bill from a general or family practitioner, internist, or cardiologist. This may be due, in part to either formal or informal hospital staff practices prohibiting non-radiologists from billing for interpretations.

Average allowed charges per episode varied substantially by specialty. This variation in charges appears to be directly related to specialty differences in the percentage of episodes with at least one visit. Radiologists, who had visits with their interpretations in only one-tenth of one percent of episodes, had the lowest average allowed charges, $18. Internists had visits in nearly 50 percent of their episodes; their average charge per episode was the highest ($117).

6.2.4 Variations in Billing Patterns by Region

The regional distribution of episodes can be seen in Table 6-9. The largest portion of the chest X-ray episodes -- 39 percent -- are from the South, while the West accounts for only 14 percent of the episodes. This pattern is virtually identical to that for office based chest X-ray episodes, and quite similar to the pattern for EKGs, probably because it follows the geographic distribution of Medicare patients.

Table 6-8
Inpatient Chest X-Ray Episodes: Percentage Distribution, Average Allowed Charges, and Percent with Visit by Specialty

Specialty	Percent Distribution of Episodes_/a	Average Allowed Charges	Percent of Episodes with at Least 1 Visit
All	500,972	$20	1.4
General or Family Practice	0.5	$71	34.6
Radiology	88.6	$18	0.1
Cardiology	0.1	$100	42.3
Internal Medicine	0.6	$117	49.2
Other_/b	10.2	$30	7.6

_/a Episodes are linked to specialties of physicians billing for chest X-ray or visit. Episodes in which more than one specialty submitted claims were counted once for each specialty represented.

_/b "Other" refers to group practices of all specialties as well as solo practices of specialties not listed here.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

Table 6-9

Average Allowed Charges per Inpatient Chest X-Ray Episode and Percent of Episodes with Visit by Region

	Number of Episodes	Average Allowed Charges per Episode	Percent of Episodes with a Visit	Percent of Episodes with at least 2 Interpretations
All Regions	498,620	$20	1.4	5.7
Northeast	111,692	$21	0.6	5.9
North Central	124,631	$21	3.0	5.4
South	194,296	$20	0.9	6.3
West	68,001	$20	1.0	4.4

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

The average allowed charges per episode are remarkably constant across regions. This is probably because the delivery of services is heavily dominated by one specialty, radiology, and because very few visits are involved. While there is variation in the percentage of episodes with visits, it is minimal, ranging from 0.6 percent in the Northeast to 3.0 percent in the North Central region. This variation, though small, does affect where savings can be realized from bundling visits with interpretations. The percentage of episodes with at least 2 interpretations varies only minimally around the national average of 5.7 percent.

6.3 Implications for Bundling

The descriptive statistics presented in the preceding section provide information helpful in examining the feasibility of various bundling strategies. Some of the key pieces of information presented in that section are as follows:

- 75 percent of claims for inpatient chest X-ray services were for interpretation only;
- only 1.4 percent of episodes had at least one visit;
- only 16 percent of episodes included more than one interpretation;
- fully 99 percent of episodes involved only one physician;
- only 16 percent of visits billed in conjunction with a chest X-ray were coded as brief or minimal.

The most important characteristic of inpatient X-ray episodes is that only 1.4 percent of them had at least one visit. This is in sharp contrast to office-based episodes, in which 65

percent had visits.[22] It is only these 1.4 percent of episodes (n=6,904) which can be considered for bundling reimbursement; thus, the potential savings are quite limited. Most of the episodes with visits had only one physician, as well as visits that were coded more intensively than brief.

6.3.1 Bundling Strategies

Strategies for bundling reimbursement for chest X-ray services delivered to hospital inpatients are conceptually similar to those for office-based services, as discussed in Section 3.3.1 of this report. The basic packaging method described in that section is a combined reimbursement for a medical visit and the interpretation component of a chest X-ray ordered or performed as part of that visit. Other issues discussed in that section relate to bundling services across time, across physicians, across multiple interpretations by the same physician, and including both the interpretation and the technical component.

There are two instances where the bundling strategies described with respect to office-based services may not be applicable to a hospital setting. The first concerns the possibility of including the technical component in the reimbursement package. Given that payment for the technical component is part of the Medicare Part A payment to the hospital, this approach is not applicable.

The other case in which strategies for bundling inpatient- and office-based services should, perhaps, differ is when a physician bills for more than one interpretation along with only one medical visit. While the clinical indications for more than

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[22]A more appropriate comparison may be with inpatient EKG episodes, 13 percent of which included a visit (see Section 4).

one chest X-ray in a matter of days in an office setting are questionable, repeat chest X-rays are often clinically indicated in the hospital for monitoring a seriously ill patient's condition. Additional chest X-rays are administered to patients in intensive care on ventilators if they are rapidly deteriorating, for example. Patients who have undergone surgery, such as lung biopsy or bronchoscopy may have chest X-rays before and after the procedure. Thus, it may be less appropriate to deny reimbursement for a second interpretation linked to a single visit in an inpatient setting.

While bundling across services is applicable to a hospital setting, the results would be quite different from those in the office-based setting. In our analysis of office-based chest X-rays, roughly 65 percent of episodes consisted of one chest X-ray and one visit billed by one physician on one day -- making these episodes candidates for the most straightforward bundling method. In contrast, only 1.4 percent of all inpatient episodes included a physician visit.[23] Clearly, the potential for bundling interpretations and visits is extremely limited.[24]

Relevant characteristics of the approximately 6,900 episodes which include a physician visit are shown in Table 6-10. Episodes are divided into four different categories by the number of interpretations and visits involved. According to the way in which the episodes were defined, any episodes in the first or second categories (either one interpretation and one visit, or one interpretation and more than one visit) involve only one physician.

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[23] For an episode to include a visit, recall that a visit must be billed on the same day or an adjacent day to the chest X-ray and by the same physician who has billed for the chest X-ray.

[24] Other sorts of packaging -- such as a DRG-type payment to physicians which incorporates reimbursement for test interpretation -- are beyond the scope of this report.

Table 6-10

Inpatient Chest X-Ray Episodes: Interpretation and Visit Billed by the Same Physician

Type of Episode		Number of Episodes	Percent with Same Physician_a
Number of Interpretations	Number of Visits		
1	1	1,600	100.0%
1	2 +	3,811	100.0
2 +	1	448	60.0
2 +	2 +	1,045	71.5
TOTAL		6,904_b	

NOTES:

_a Cases in which same physician bills for all interpretations and visits in episode.

_b Represents 1.4 percent of total episodes (100 percent of episodes with at least one visit).

Source: Project HOPE estimates based on the 1988 5% linked MedPAR and BMAD Beneficiary File.

Among the episodes with at least two interpretations, between 60 and 72 percent involved only one physician. In the third category (2 or more interpretations and 1 visit), 40 percent included an interpretation by a physician not billing for a visit.

The array of fees hypothetically available to a physician billing for a chest X-ray interpretation and a medical visit are shown in Table 6-11. The majority of visits are limited or intermediate. The distribution of all visits billed within the episodes is different from that for office-based visits in terms of the two extreme categories -- there are more brief visits billed in the inpatient setting and fewer comprehensive visits provided. Brief or minimal visits account for only 6 percent of office-based visits but 16 percent in the inpatient episodes; recall that the CPT manual expressly allows billing for interpretation of diagnostic tests along with a brief visit.

The reimbursement that a physician would receive for a chest X-ray and a given level of inpatient visit before and after the imposition of a bundling requirement is also shown in Table 6-11. As described previously, for our purposes, bundling implies that the fee for interpretation would be disallowed if provided along with a visit by a single physician. Thus, with the exception of a brief visit, the fee becomes the visit fee. Assuming no changes in physician coding of visit intensity, reimbursement would decline by up to 33 percent post-bundling.[25] However, as discussed in Section 3.3.1, there is a range of possible behavioral responses by physicians -- such as billing for a higher level of visit -- which are probably equally applicable to the inpatient setting. In particular, for the 25 percent of

[25] The largest change would be for the visit level with the lowest original charge; thus, for a limited visit total reimbursement would fall by $13/$39 or 33 percent.

Table 6-11

Average Allowed Charges for Inpatient Chest X-Ray Episodes: Pre-Bundling and Post-Bundling

Type of Visit	Percent Distribution of Visits	Allowed Charge (Visit Only)	Total Reimbursement for Visit and Chest X-Ray Interpretation Pre-Bundling_a	Total Reimbursement for Visit and Chest X-ray Interpretation Post-Bundling_b
Brief or minimal	16.0%	$20	$33	$33
Limited	25.2	26	39	26
Intermediate	36.1	35	48	35
Extended	6.2	45	58	45
Comprehensive	16.2	80	93	80

Note:

_a Assumes $13 for interpretation claim.

_b Assumes interpretation fee is disallowed when Chest X-Ray is provided along with other than brief/minimal visit.

Source: Project HOPE estimates based on the 1988 5% linked MedPAR and BMAD Beneficiary File.

chest X-ray related visits that are currently coded as limited, post-bundling reimbursement could be increased by downcoding to a brief visit, allowing retention of the interpretation fee.

6.3.2 Estimates of Savings from Bundling

In this section, we describe the methods used to calculate the savings to the Medicare program which would be realized through bundling of chest X-ray interpretation and physician inpatient visits. The assumption used throughout this report is that, with bundling of reimbursement, physicians would not be reimbursed for the interpretation component of chest X-rays when delivered in conjunction with a physician visit (except for those visits coded as brief).

Upper bound estimates of the savings are presented in Table 6-12. These estimates include all chest X-ray interpretations performed in the 6,904 epidoses with at least one visit. Thus, they include some interpretations billed by physicians who did not bill for a visit and some interpretations billed with a brief visit. These estimates are, then, somewhat higher than the potential savings likely to accrue.

Due to the small proportion of episodes with visits, disallowing reimbursement for chest X-ray interpretations billed in conjunction with a physician visit in a hospital setting would result in savings of approximately $185 thousand for the 5 percent BMAD sample. When this amount is increased by a factor of 20 to represent the total Medicare population, the savings to the Medicare program amount to approximately $3.7 million. This sum, due to bundling the payment for these types of interpretations with medical visits, translates into a 1.8 percent

Table 6-12

Estimated Savings from Bundling Reimbursement of Chest X-Ray Interpretation with Inpatient Visit Fee, by Specialty and Region

	Upper Bound Estimate
All Medicare beneficiaries_a	$3,707,920
5% sample	$ 185,396
Region	
Northeast	$ 22,486
North Central	$ 84,346
South	$ 55,461
West	$ 23,103
Specialty	
General/Family Practice	$ 27,159
Radiology	$ 20,058
Cardiology	$ 7,545
Internal Medicine	$ 43,207
Other	$ 87,427

_a Estimate for the 5% beneficiary sample multiplied by a factor of 20.

Source: Project HOPE estimates based on a 1988 5% linked MedPAR and BMAD Beneficiary File.

reduction in Medicare outlays for these services.[26] Potential savings from bundling are substantially less in a hospital setting compared to an office setting, primarily because of the smaller proportion of visits billed in conjunction with a chest X-ray.

6.3.3 Impact by Specialty and Region

The distribution of savings by region and specialty are also shown in Table 6-12. Almost half of the savings occur in the North Central region, due to the higher proportion of visits in that region. The Northeast and West each account for just over 10 percent of the savings.

Decreased payments to internists and general and family practitioners account for almost 40 percent of savings. Almost half the savings come from "other" physicians, suggesting that the impact would be quite diffuse. While the impact on radiologists practicing in an inpatient setting appears to be quite negligible, some of the "other" physicians may include radiology groups.

The extreme variation across specialties has direct policy implications. Radiologists would incur less than a one percent reduction in reimbursement even through they provide the vast majority of chest X-ray-related services. The internists, cardiologists, and general family practitioners, on the other hand, would experience the greatest reduction in reimbursement. This is because they provide more visits in conjunction with the chest X-rays. An important question which cannot be answered

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[26] The percentage reduction in overall reimbursement for chest X-ray-related inpatient services is calculated by dividing the savings estimates by the total charges for services in all episodes. Note that the denominator includes inpatient chest X-rays and <u>related</u> visits only.

through claims analysis is how often the non-radiologists are making treatment decisions based on their own readings in contrast to waiting for the radiologist's interpretation. The answer to this question would affect the acceptance of a bundling policy by non-radiologists. From a policy perspective, the issue of payment for second interpretations by radiologists should also be considered.

Two points should be noted. First, the estimates of the effect of bundling on reimbursement levels shown in Table 6-13 indicate the percentage of reimbursement for chest X-ray-related services only, not as a percentage of the specialty's or region's total Medicare reimbursement. Thus, while the reduction in reimbursement to non-radiologists represents over 10 percent of those specialties' current reimbursement for these services, services related to chest X-ray are probably a very small proportion of their total income from Medicare. Second, these percentage reductions in reimbursement do not mean an across-the-board decrease for all physicians of a particular specialty or region. Instead, the percent reduction represents an average for the entire specialty or region; however, within each specialty and region, particular physicians would gain and others would lose.

Table 6-13

Effect of Bundling Chest X-Ray Interpretation with Inpatient Visit Fee on Reimbursement Levels by Region and Specialty

	Percent reduction in reimbursement _a
Total	1.8%
Region	
Northeast	1.0%
North Central	3.2%
South	1.5%
West	1.7%
Specialty	
General/Family Practice	14.3%
Radiology	0.2%
Cardiology	14.7%
Internal Medicine	12.7%
Other	5.8%

Note:

_a The percent reduction in reimbursement is calculated by taking the savings noted for each category (overall, region, and specialty) in Table 6-12 and dividing these totals by the overall charges for all episodes in these categories.

Source: Project HOPE estimates based on the 1988 5% linked MedPAR and BMAD Beneficiary File.

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APPENDIX A

Table A-1

EKG Charges by Place and Level of Service*

Place of Service	Total Allowed Charges	Percent Distribution by Place of Service	Percent Distribution by Level of Service: Global	Interpretation Only	Technical Only
Office	$345,334,868	59.8%	97.4% $336,225,749	2.0% $6,749,586	0.7% $2,359,533
Home	957,658	0.2%	78.3% 749,919	13.6% 130,322	8.1% 77,417
Inpatient Hospital	174,734,960	30.3%	1.5% 2,690,078	98.4% 171,856,166	0.1% 188,716
Skilled Nursing Facility	3,583,545	0.6%	72.7% 2,604,641	16.6% 594,805	10.7% 384,099
Outpatient Hospital	46,148,323	8.0%	3.6% 1,661,305	96.3% 44,418,906	0.1% 68,112
Independent Lab	2,147,824	0.4%	56.2% 1,206,972	18.3% 392,408	25.5% 548,444
Other	2,350,829	0.4%	11.4% 267,961	6.6% 156,172	82.0% 1,926,696
Kidney Treatment Center	47,842	0.0%	31.7% 15,179	38.5% 18,416	29.8% 14,247
Ambulatory Surgery Center	140,188	0.0%	53.3% 74,741	45.2% 63,421	1.4% 2,026
Hospice	3,196	0.0%	63.3% 2,022	36.0% 1,149	0.8% 25
Nursing Home	1,993,260	0.3%	72.8% 1,451,299	12.2% 242,995	15.0% 298,966
TOTAL	$577,442,493	100.0%			

*Charges for EKG include 12 lead, rhythm, and other EKG.

Source: 1988 BMAD I.

Table A-2

Chest X-Ray Charges by Place and Level of Service

Place of Service	Total Allowed Charges	Percent Distribution by Place of Service	Percent Distribution by Level of Service		
			Global	Interpretation Only	Technical Only
Office	$200,233,671	38.7%	94.3%	4.4%	1.3%
Home	804,820	0.2	63.0	13.5	23.5
Inpatient Hospital	202,903,948	39.2	0.9	99.1	0.0
Skilled Nursing Facility	10,462,167	2.0	79.4	7.7	13.0
Outpatient Hospital	85,552,688	16.5	0.4	99.6	0.0
Independent Lab	349,417	0.1	91.5	4.4	4.2
Other	660,902	0.1	62.3	27.1	10.5
Kidney Treatment Center	2,995	0.0	35.8	59.0	5.2
Ambulatory Surgery Center	167,355	0.0	23.0	76.4	0.6
Hospice	3,054	0.0	93.6	6.4	0.0
Nursing Home	8,370,073	1.6	32.1	7.2	60.7
TOTAL	$509,511,090				

Source: 1988 BMAD I/Procedure File